

hp-ux/usr

Hands-On Solutions for HP-UX Users • November 1995



SD FOR HP-UX 10.0—Part II ■ A User's Guide to RTE-A 6.2
Building a Tool for Remote UNIX Administration
How Are Your System Resources Being Used, Part I

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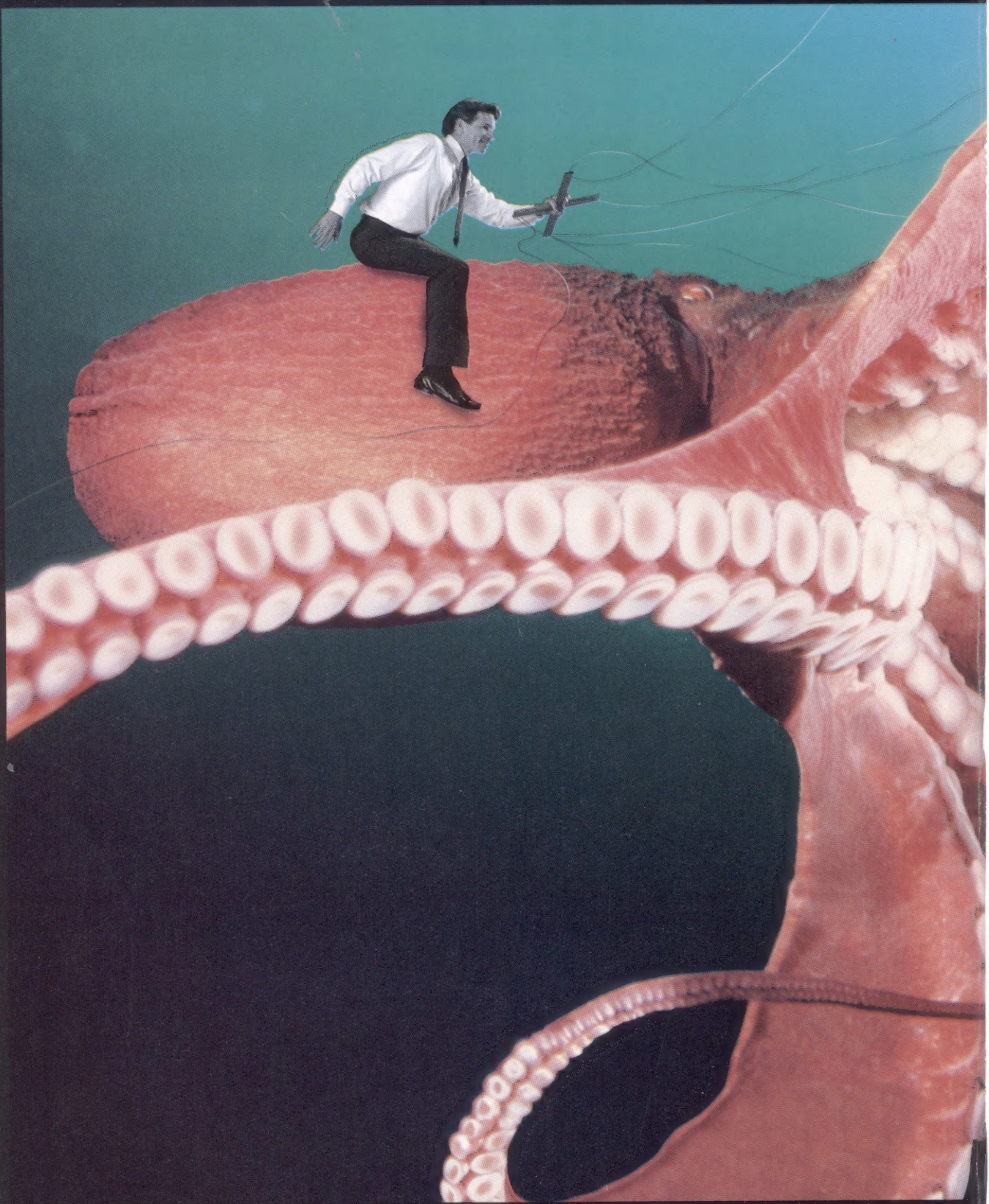
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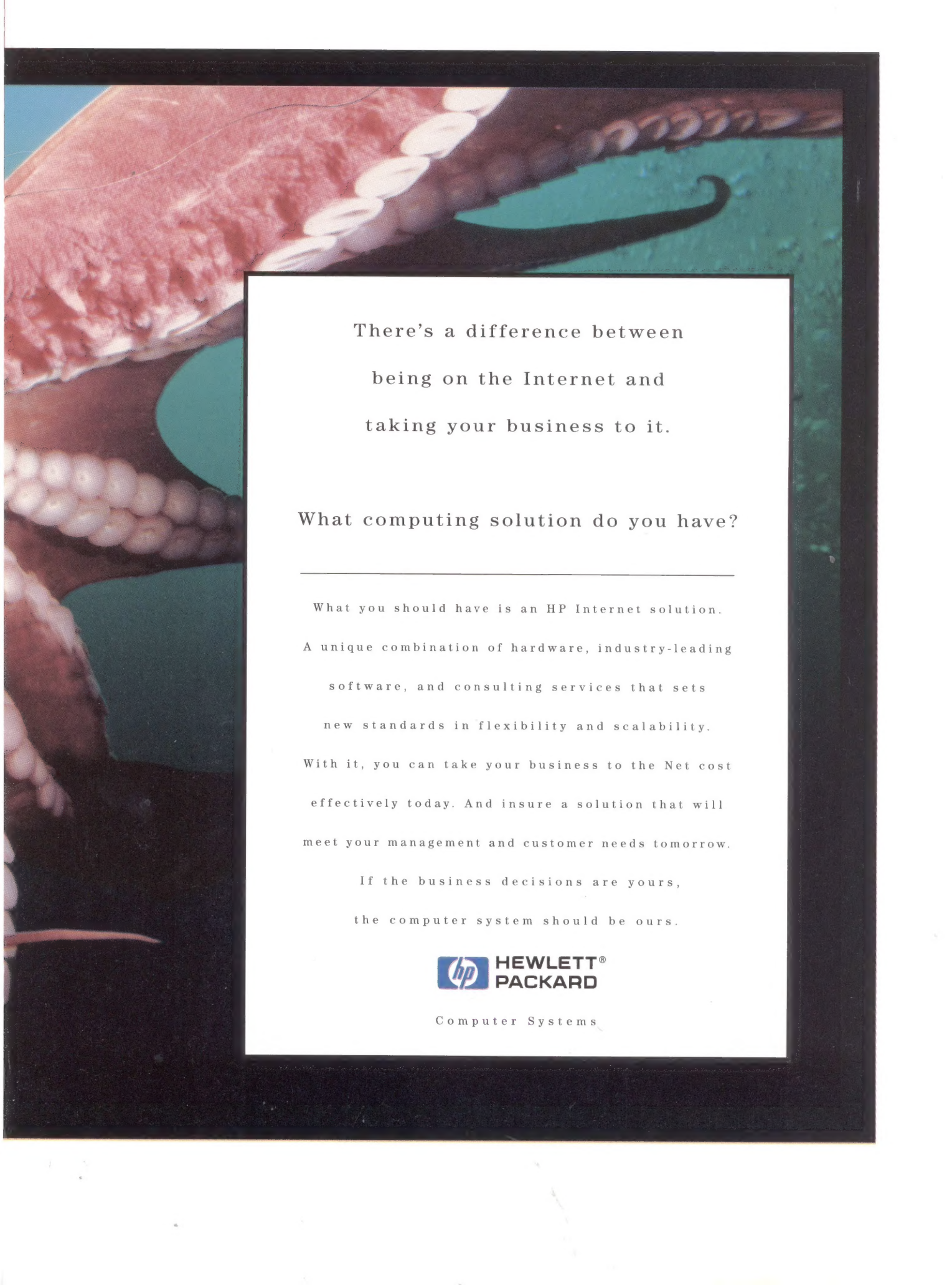
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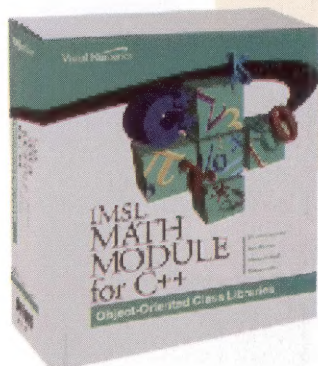
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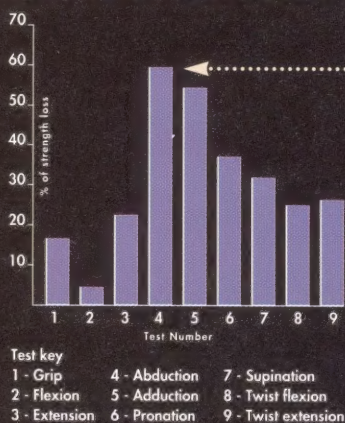


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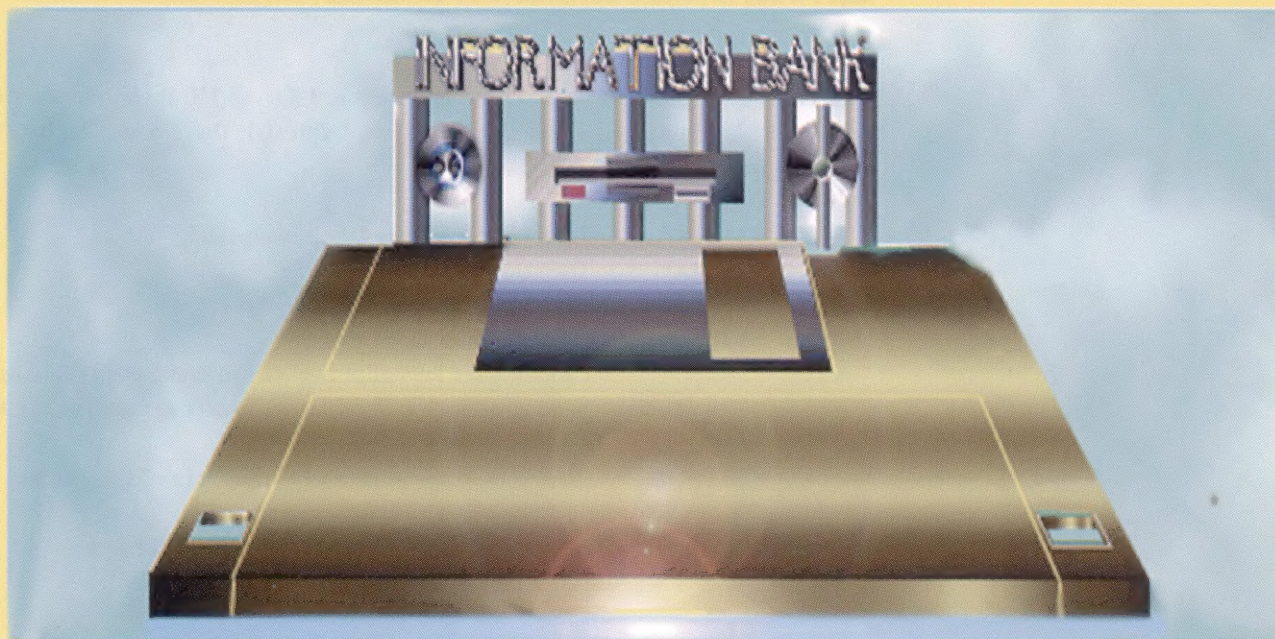
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Question & Answer

Q: I'd like to control the softkeys on an hpterm. How do I turn them on/off?

A: Here are the sequences. These are standard for all HP terminals starting with the 262xx family (i.e., 2622A, 2623A, etc.) through the current Series 700 character terminals.

<code>echo "33&j@"</code>	Turn off the softkey labels completely
<code>echo "33&jA"</code>	Turn on the MODES keys
<code>echo "33&jB"</code>	Turn on the User (function) keys
<code>echo "33&jS"</code>	Lock the User label keys on
<code>echo "33&jR"</code>	Unlock User keys allowing user to make display change
<code>echo "33&j#Lmsg"</code>	Send a message that replaces the user key area where # is number of chars in msg
<code>echo "33&jC"</code>	Clear a message in user key area and redisplay labels

The last two entries allow you to write protected messages in the area where the softkeys are normally displayed.

Q: I've had problems when reconfiguring primary swap and LVM. What is the purpose of the *lvlnboot* command?

A: Anyone who has configured the "root volume group" of an LVM-based system will recognize that one of the most significant commands in this process is *lvlnboot(1m)*. Understanding when and how to use *lvlnboot* requires a bit of information about the Boot Data Reserve Area (BDRA) and the LABEL area.

When you make modifications to the root VG or Volume Group, *lvlnboot* must be run to update two areas of each bootable disk, the BDRA and the LABEL file, with current information about the VG and about the lvol's which have been configured. Unlike other VGs, which use the file */etc/lvmtab* to store information about volume groups and their associated disks, the root VG must be activated before the file systems are mounted.

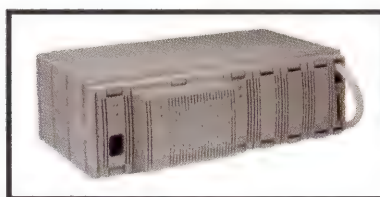
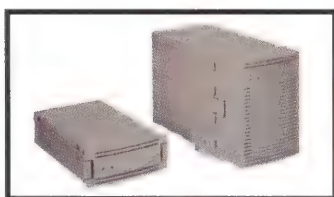
The LABEL file is used by the boot loader (ISL) so that it can find the root file system to load the kernel, and the BDRA (Boot Data Reserve Area) is used by the LVM to determine which disks are in the root VG (including their hardware paths) and the locations of the logical volumes assigned to the root file system, primary swap, and dump.

Since the information in the LABEL and BDRA is used early in the boot process, this information effectively overrides any modifications made to the root VG using commands other than *lvlnboot*, so it is critical to keep this information current with any changes made to the root VG to avoid conflicts and confusing boot errors. If BDRA information directs the LVM to look at the wrong hardware path for a disk, for example, it will not find the needed information at that hardware path, and possibly prevent bootup, because of a lack of quorum or conflicting LVM information

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The most general way to use *lvlnboot* is with the *-Rv* option. From the man page: this option causes *lvlnboot* to examine the information already configured in the BDRA of all bootable disks, and update that information to reflect the current configuration of all disks in the VG and all logical volumes already specified. Since this option will only update the existing information in the BDRA, this cannot be used to change *which* logical volumes are used for root, swap, or dump.

This option is most useful when making modifications to the root VG that involve changes in hardware (adding/removing/moving disks) or logical volume attribute changes (mirroring configurations, changes in LV size).

Changes of *which* logical volumes are to be configured as root, primary swap, or dump are made using the *-r*, *-s*, and *-d* options, and the current configuration of these can be seen without making modifications by using the *-v* option alone. One can always start from scratch with:

```
lvrmbboot -r /dev/vg...
```

to clear all the boot information, and start over again. Note that *lvlnboot* does not check places like */etc/checklist* for changes.

For example, if you specified a different LV for root in checklist, but didn't run *lvlnboot -r* to specify the new LV for root, the wrong LV would be mounted on the system by the time it came up. Also, if the change were made to checklist and then *lvlnboot -R* run, the *lvlnboot* command would update the information about the **original** LV, instead of updating the information to reflect the change in checklist. The possible

dangers here become more apparent when configuring primary swap.

And in the kernel generation file, the best policy is to use:

```
root    on    lvol;
dumps   on    lvol;
swap    on    lvol;
```

which will disconnect any changes in hardware configs from the kernel's idea of where to find *root/swap/dump*.

Q: We're having problems with our LAN and need to reset the LAN card as we troubleshoot the system. How can this be done without rebooting?

A: The program *landiag* will do this. You can run it interactively and choose from the menus:

```
LOCAL AREA NETWORK ONLINE DIAGNOSTIC, Version 1.0
      Tue, Aug 29, 1995      17:10:09
      Copyright 1985 Hewlett Packard Company.
      All rights are reserved.
```

Test Selection mode.

```
lan      = LAN Interface Diagnostic
menu     = Display this menu
quit     = Terminate the Diagnostic
terse    = Do not display command menu
verbose  = Display command menu
```

Enter command: lan

LAN Interface test mode. LAN Interface device file = /dev/lan0

```
clear    = Clear statistics registers
display  = Display LAN Interface status and statistics registers
end      = End LAN Interface Diagnostic, return to Test Selection
menu     = Display this menu
name     = Name of the LAN Interface device file
quit     = Terminate the Diagnostic, return to shell
reset    = Reset LAN Interface to execute its selftest
```

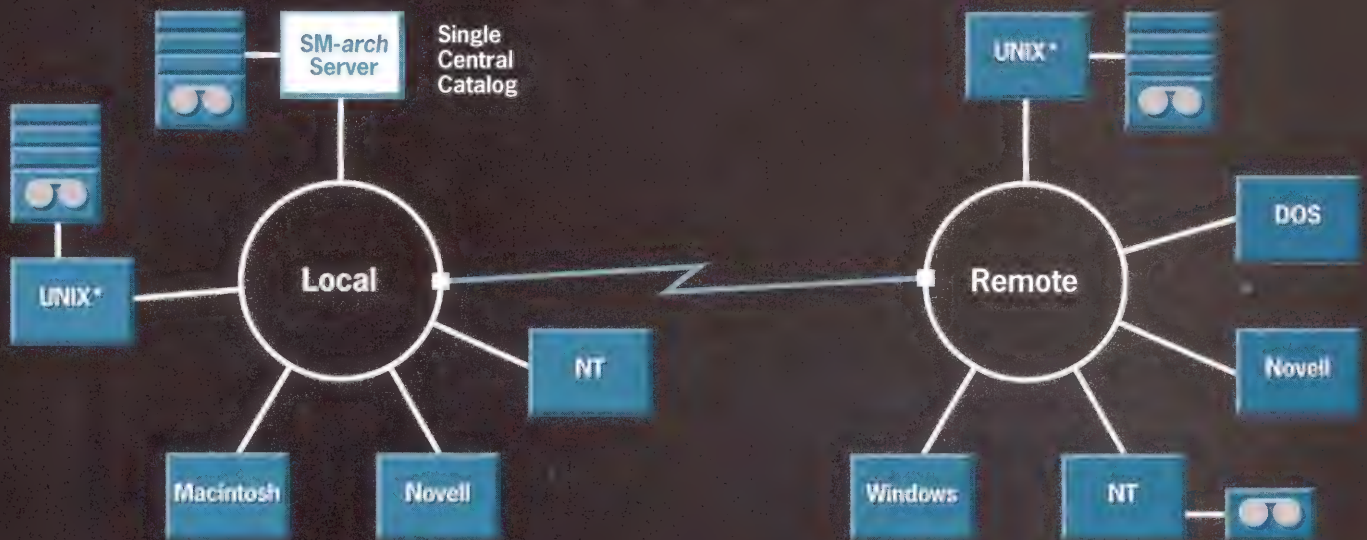
Enter command: reset

and the interface will be reset (assumes *lan0* is the default interface). Or you can do everything via the command line as in:

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```
echo "lan\nreset" | landiag -t
```

which accomplishes the same thing. To see the current state of the LAN interface, use:

```
echo "lan\ndisplay" | landiag -t
```

Q: I need to keep several machines in time sync with each other but many are quite old (pre 7.0 HP-UX systems) and the Network Time Protocol is very difficult to port to these older machines. Any ideas?

A: If you need only 1-2 second accuracy, try this:

1. Select a master timekeeper system. Ideally, it can be synced to a master clock or you can even call the National Bureau of Standards time clock and decode the current time of day once every couple of weeks.
2. Use *remsh* from each client to the master to get the time of day from the master, i.e.:

```
remsh masterclk date +%m:%d:%H:%M:%y
```

which will produce something like this:

```
08:29:17:51:95
```

for a date of: Tue Aug 29 17:51:45 EDT 1995

3. Now calculate the time needed to reach the next even minute from the current time of day. This will take some math commands to account for 60-second minutes. This is the sleep time.
4. Sleep for the specified number of seconds, possibly one less second if the client system is slow, and then execute the *date* command with the output above arranged without the colons, as in:

```
date 08291895
```

Note that the minute was bumped up by one, and if needed, bump up the hour.

Now it gets a bit tricky. If we execute the *date* command, it will set the current date to match the master system. But if

the new date causes the clock to be set backwards, the client's *date* command will ask:

```
date: do you really want to run time backwards?[yes/no]
```

and this requires three special steps:

- a. kill the current *cron* daemon
- b. execute the *date* command and answer yes (hint: man yes)
- c. start *cron* again

You can simplify the script's math by making sure it never runs close to the hour or close to midnight, but this assumes that no one sets the time on the client manually to a strange value.

Place this script in *crontab* for every client and vary the execution time over several minutes for each client. Having every machine hit on the master at the same hour might be a big impact. This should keep things fairly well synced.

Q: I have a Series 700 computer that I configured to use the RS-232 port as the console through boot admin. However, I don't have the right cable and need to reconfigure it back to graphics mode. How can I do this without a console?

A: Power the system on, and watch the LEDs. When the two outermost are lit (1 and 8) and there is no other LED activity, press the TOC button. This will reset the system paths to their defaults.

Q: I'm getting the following error when I log in: stty: Can't assign requested address error. What's wrong?

A: More than likely, you have added an *stty* command to *.kshrc/.cshrc*. *rcp* and *remsh* don't allocate a pty, so they will fail with this message.

General HP-UX and 9000 questions are answered by Bill Hassell, a support engineer at the HP Atlanta Response Center. He can be contacted via e-mail at blh@hpuerca.atl.hp.com.

Workstations

Q: I have an HP 9000 Series 715 workstation running HP-UX 9.05 and BASIC/UX 7.1. The 715 workstation has a built-in floppy drive that I would like to use with BASIC/UX 7.1. I have followed the instructions in the *Installing and Maintaining HP BASIC/UX* manual on setting up a LIF device, but I cannot access the floppy drive through BASIC/UX. The instructions directed me to create a device special file for the 700 as follows:

```
mknod /dev/rfloppy/drive0 c 106 0x201000
```

I created the file and then, continuing to follow the instructions, I copied `/etc/newconfig/rmb/rmbrc` to my home directory as `“rmbrc”` and edited the file and added the following line to the `$HOME/.rmbrc` per the instructions:

```
DISK 702 = /dev/rfloppy/drive0
```

I then tried to access the floppy drive as the manual suggested through the following BASIC/UX command:

```
MSI ":,702"
```

I was unable to access the floppy through BASIC/UX. I retraced my steps and rechecked the manual.

Is the manual correct? Have I missed some steps? What would prevent me from accessing the floppy drive?

A: There are two possible scenarios that can cause the problems with the setup you have described. First, the manual is somewhat misleading when it suggests that you add the following line to your `.rmbrc` file:

```
DISK 702 = /dev/rfloppy/drive0
```

This line sets up the floppy drive as a device at pseudo select code 7, which could conflict with a SICL hpib card at the same pseudo select code. The hpib card is configured through the `/usr/pil/etc/hwconfig.cf` file and the default configuration for the first hpib card is select code 7. To correct this just edit the `$HOME/.rmbrc` file and change the above line to a different pseudo select code as follows:

```
DISK 1402 = /dev/rfloppy/drive0
```

The second possibility is that you may have configured the device special file incorrectly. The example `mknod` command shown in the *Installing and Maintaining HP BASIC/UX* manual is for a SCSI floppy. It is possible that the built-in floppy drive in your 715 workstation is a PC floppy. To check this execute the `ioscan -f` command, which will return an output similar to the following:

CLASS	H/W PATH	DRIVER	H/W STATUS	S/W STATUS
graphics	1.0.0	graph3	ok(0x785)	ok
scsi	2.0.1	c700	ok(0x7082)	ok
scsk	2.0.1.6.0	scsi	ok(0x202)	ok
lan	2.0.2	lan01	ok(0x708a)	ok
serial	2.0.4	asio0	ok(0x708c)	ok
parallel	2.0.6	parallel	ok(0x7074)	ok
audio	2.0.8	audio	ok(0x707b)	ok
floppy	2.0.10	pcfdc	ok(0x7083)	ok
disk	2.0.10.1.0	pcfloppy	ok(0x0)	ok ←
ps2	2.0.11	ps2	ok(0x7084)	ok ←
ps2	2.0.12	ps2	ok(0x7084)	ok
serial	2.0.13	asio0	ok(0x708d)	ok

Notice the entries highlighted by the arrows. They are the result you will see from an `ioscan -f` if your system contains a PC floppy drive rather than a SCSI floppy drive. If this is the case, then you will need to use a different `mknod` to create the device special file for this device. The command will be as follows:

```
mknod /dev/pcfloppy c 112 0x20a100
```

You will also need to edit your `$HOME/.rmbrc` file and edit the line we mentioned above as follows:

```
DISK 1402 = /dev/pcfloppy
```

Q: I have an HP 9000 Series 715 running HP-UX 9.05. I purchased an application that uses the audio capabilities of HP-UX at 9.05. My problem is that the application directs the sound output to the internal speaker of the 715 and the speaker is not loud enough. I have checked with the developers of my application and there is no way to redirect

Topics Coming in the January Issue of

hp-ux/usr



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by *Chris Cobb*

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by *Marty Poniatowski*



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the output to the external port. Is there a way that I can crank up the volume of the internal speaker to get around my problem?

A: To adjust the volume of the audio subsystem supplied with HP-UX 9.X, just execute the following command:

```
/usr/audio/bin/acontrol
```

This will bring up the acontrol widget:

acontrol	
Monitor	[[#_____]]
Record	[[#_____]]
Play	[_##_____]

Then slide the Monitor and Play sliders (represented by the ## in the diagram) to the far right, which will set the volume to its maximum setting. However, the internal speaker of an HP Series 700 computer may not be loud enough, depending on your environment. The internal speaker on your workstation is about the size of a half dollar and is buried inside the workstation. The speaker was intended to be used as a typing bell, not a loudspeaker. I can suggest one other alternative. Since your application is hard coded to the internal speaker, a workaround would be to fool the audio subsystem. The audio subsystem connects to the audio hardware through a device special file. These files are as follows:

```
crw-rw-rw- 1 root sys 57 0x208000 Jun 6 17:35 /dev/audio
crw-rw-rw- 1 root sys 57 0x208002 Jun 6 17:35 /dev/audioBA
crw-rw-rw- 1 root sys 57 0x208003 Jun 6 17:35 /dev/audioBL
crw-rw-rw- 1 root sys 57 0x208001 Jun 6 17:35 /dev/audioBU
crw-rw-rw- 1 root sys 57 0x208100 Jun 6 17:35 /dev/audioCtl
crw-rw-rw- 1 root sys 57 0x208012 Jun 6 17:35 /dev/audioEA
crw-rw-rw- 1 root sys 57 0x208013 Jun 6 17:35 /dev/audioEL
crw-rw-rw- 1 root sys 57 0x208011 Jun 6 17:35 /dev/audioEU
crw-rw-rw- 1 root sys 57 0x208022 Jun 6 17:35 /dev/audioIA
crw-rw-rw- 1 root sys 57 0x208023 Jun 6 17:35 /dev/audioIL
crw-rw-rw- 1 root sys 57 0x208021 Jun 6 17:35 /dev/audioIU
```

Notice that the device files are identified with certain letter designations such as "IA" or "EA". These designators identify the following characteristics:

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- I stands for using the internal speaker
- E stands for using the external jack
- B stands for using both the internal and external
- U stands for using 8-bit MuLaw data format
- A stands for using 8-bit ALaw data format
- L stands for using 16-bit linear data format
- Ctl stands for control only (read & write not allowed)

To fool the audio subsystem just remake the internal device files with the external minor numbers as follows:

```
crw-rw-rw- 1 root sys 57 0x208022 Jun 6 17:35 /dev/audioIA
crw-rw-rw- 1 root sys 57 0x208023 Jun 6 17:35 /dev/audioIL
crw-rw-rw- 1 root sys 57 0x208021 Jun 6 17:35 /dev/audioIU
```

would change to:

```
crw-rw-rw- 1 root sys 57 0x208012 Jun 6 17:35 /dev/audioIA
crw-rw-rw- 1 root sys 57 0x208013 Jun 6 17:35 /dev/audioIL
crw-rw-rw- 1 root sys 57 0x208011 Jun 6 17:35 /dev/audioIU
```

This should direct the audio output of your application to the external speaker jack of the 715 workstation. Then with a speaker or speakers attached that contain an internal amplifier, you can adjust the volume to the desired level.

Q: We are running BASIC/UX 7.1 on an HP 9000 Series 735 and HP-UX 9.05. We also have an HP Envizex X terminal connected to the 735 from which we run BASIC/UX 7.1. My problem is that the keyboard mapping is incorrect. Is there a way to change the keyboard mapping of the X terminal to get the functionality needed in BASIC/UX? We especially need to be able to do an insert line while in the BASIC editor.

A: Yes, please see the *README.FIRST* file in */etc/newconfig/rmb*. This file will explain the new keyboards that are supported by HP BASIC/UX 7.1 and how to change the keyboard mapping. You will probably find that all that is required to correct your keyboard problems is to execute the following *xmodmap* command:

```
/usr/bin/X11/xmodmap /etc/newconfig/rmb/xmodmap.PC
```

which will modify the keyboard mapping for your X terminal as follows for use with HP BASIC/UX 7.1:

RMB function	ITF keyface	PS2 DIN keyface
=Clear	I/O Break	Scroll Lock
=Reset	Reset (Shift-Break)	Reset (Shift-Scroll Lock)
=Pause	Stop	Pause
=Stop	Shift-Stop	Stop (Shift-Pause)
=Menu	Menu	Print Screen
=Shift-Menu	Shift-Menu	Shift-Print Screen
=System	System	Num Lock
=User	(Shift-System)	Shift-Num Lock
=Ins Char	Insert char	Insert
=Ins Line	Insert line	Shift-Insert
=Del Char	Delete char	Delete
=Del Line	Delete line	Shift-Delete
=Clr->End	Clear line	End
=Clr Ln	Shift-Clear line	Shift-End
=Clear Scr	Clear Display	Alt-End
=Clear Scr	Clear Display	Shift-F12 (alternate method)
=Home	Home (hollow up-arrow)	Home
=Shift-Home	Shift-Home	Shift-Home
=Select	Select	Shift-Return
=Recall	F9	F9
=Shift-Recall	Shift-F9	Shift-F9
=Alpha	F10	F10
=Dump Alpha	Shift-F10	Shift-F10
=Graphics	F11	F11
=Dump Graph	Shift-F11	Shift-F11
=Result	F12	F12



Workstation Questions are answered by Rudy Stanley. He is an applications support engineer with the Hewlett-Packard Response Center in Atlanta, Georgia. He can be reached via e-mail at: brst@hpuerca.att.hp.com.

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by Lisa Zahn

Honeywell's Space and Strategic Systems Operation Division

IN OUR LAST ISSUE, we profiled the University of Iowa's College of Engineering ICAEN department. The subject of this issue's site profile is Honeywell, Inc.'s Space and Strategic Systems Operation division. We spoke with Lee Dreger, staff engineer and chief architect for their engineering workstation network.

SS: How is your support organization structured, and what administrative areas do you support?

We are responsible for the architecture, evolution, and support of our location's Engineering Workstation Network. Our 10-member staff consists of operations administrators and analyst/engineering administrators. The operations sys admins administer user accounts, perform user data backup/restores, and provide general user support and resource management.

The analyst/engineering admins are responsible for defining the overall architecture, defining and developing systems, integrating and testing workstation hardware and software configurations, implementing new software revisions, and optimizing sys admin processes. Together, we support about 250 users and 200 systems.

SS: Are you an information services organization or are you part of your company's engineering organization?

Our group is part of the division's engineering organization. There's also an IS department on site that supports business data processing and PC applications and the facility's networks. Although we're in separate organizations, we work very closely with IS with respect to the networks at our facility, especially over the last year and a half, as we've been implementing a new network architecture for our UNIX workstation environment. We also share

with them the maintenance of user, data, and network security.

SS: What level of daily support do you provide your users?

Our EWS environment runs 24 hours a day, 7 days a week, but our coverage runs from 7 a.m. to 7 p.m., Monday through Friday. During critical project phases, we are sometimes asked to be on call and occasionally to have someone on site.

We also have a help desk function, which we use to log, track, and dispatch user support calls and to track hardware resources. Actual user support is handled by a combination of our EWS support team, an internal group of expert users, and "direct-to-vendor" calls.

SS: What types of applications are run in your environment?

Our division uses CAE tools for the design and simulation of avionic subsystems, primarily guidance, navigation, and control systems for the space and aviation industries. The applications in our environment are about 80 percent electrical CAD, e.g., Mentor Graphics, and 20 percent mechanical CAD, e.g., SDRC. We support more than 60 third-party CAE applications of these types in our environment.

SS: What kind of computers and operating systems do you support in your environment?

We have a fairly large site with 200 nodes, including workstations, file and compute servers, X terminals, and printers.

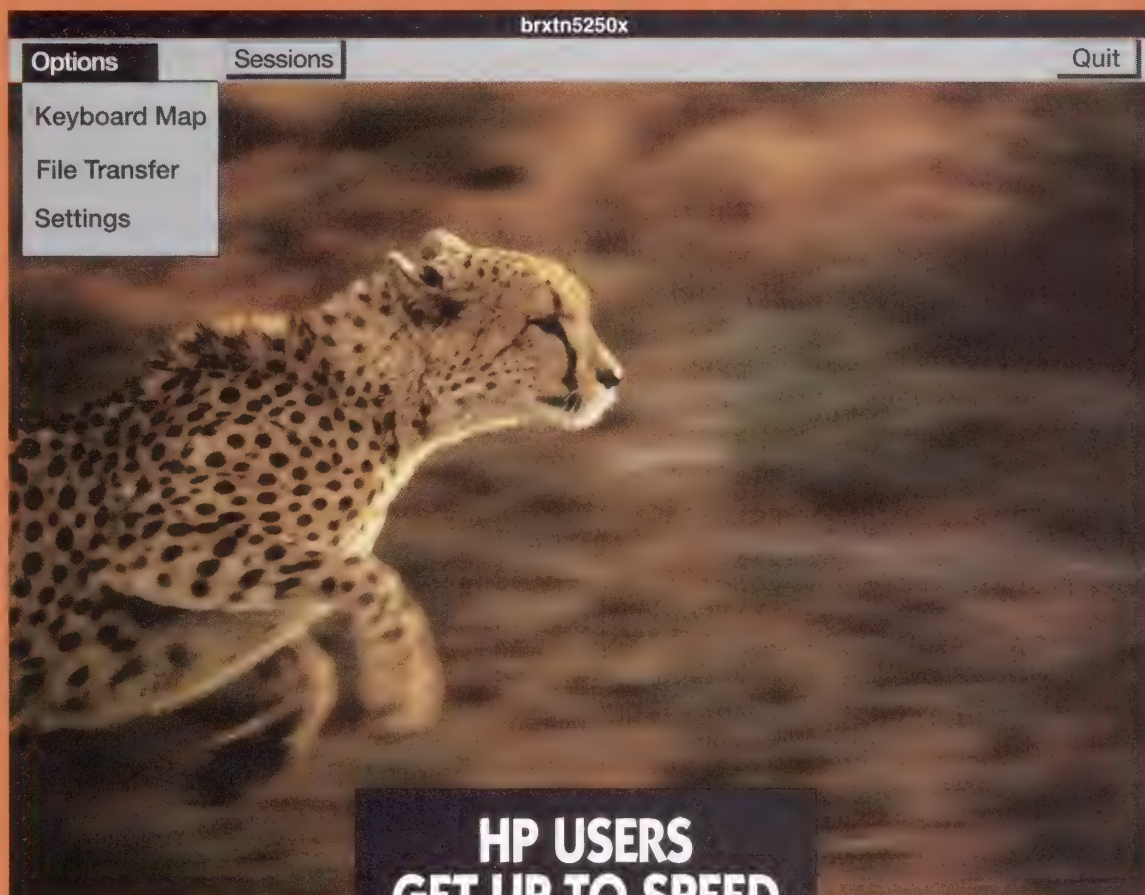
There are 140 HP 9000 Series 700 and Series 800 systems and 50 Apollo DN400 systems. The 700s and 800s run HP-UX, while the DN400 systems run Domain/OS.

SS: Can you describe a typical desktop system or systems in your environment?

We use moderately configured workstations that run as dataless, application-less clients; we decided not to invest too much money in desktops, since their

Continued on Page 20

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architecture changes so rapidly. Our typical desktop system is an HP 715/100 running HP-UX 9.05 with 64 MB to 128 MB of RAM, the standard HCRX graphics subsystem, and a minimal disk configuration that is adequate to support the operating system and provide enough swap space for most user tasks.

We strive to keep the operating system configuration consistent across all of our desktop systems. Desktop updates and major changes occur during quarterly shutdowns. At this time, we install the latest operating system image on every desktop in the environment, which proactively eliminates file system corruption that typically occurs over time. We run the system builds and rebuilds concurrently over the network using a home-grown process based on the diskless-cluster feature of HP-UX. We capture our production O/S image, then run our installation tool to boot the desktops diskless[®] over the network, download the image to them, and automatically shut down and reboot the systems. We can upgrade 40 to 50 desktops an hour using this process, and it's completely automated once it starts up.

SS: Does your environment use central file servers and compute servers for shared resources or is your environment widely distributed?

Central file servers and compute servers are the cornerstones of our environment. We presently use two file servers to store 90 percent of all data, and have two dedicated file servers that host our third-party application binaries. Both data and binary file servers are configured to be highly available. The data servers have RAID disk subsystems for data and mirrored disks for the operating system, while the binary servers are set up to be redundant to provide reli-

bility for running critical applications. Our existing file servers are HP Series 800 G60 and H60 systems configured with a large amount of RAM for disk buffer caching and an FDDI network interface; we are also in the process of setting up an HP K200 file server with a 32-GB RAID disk array. User logins and jobs are *not* allowed on the file servers; this rule ensures reliable predictable service for the clients.

For compute servers, we have fifteen HP 735 systems and four 755 systems, each with 300 MB of RAM and large amounts of disk for virtual memory support. They support large user simulations and tasks.

SS: You mentioned an FDDI network interface. What does your network look like?

We consider the network to be a critical resource in our computing infrastructure and have made a significant investment to build one that is robust and high capacity. Because we're old Apollo customers, we were able to use our experience with a large networked environment to "design out" many of the problems typically encountered in a large network and also to make future changes easy.

Our network topology is flat—there are no IP subnets, and therefore no routers to slow the network down.

We use a 100 MB/s FDDI dual attach ring backbone and Ethernet switches with FDDI-to-Ethernet translational bridging to connect desktops and servers. The servers have 100 Mb/s FDDI network connections, while each desktop has a dedicated 10 Mb/s (10 Base T) Ethernet connection. The dual attach ring backbone and dual homed switching hubs provide a high degree of fault tolerance to our system—we can lose or remove a single piece of equipment without affecting the rest of the

network. We still run the Apollo ring network; it connects via Ethernet to one of our switching hubs.

Our network switching equipment is housed in "hub rooms" that run on UPS power. We use 24-pair multimode fiber between the hub rooms and between buildings, and category 5 UTP wire from the hub room to each desktop. Because the wiring to support 100 Mb/s to the desktops is already in place, and because we've configured our hubs to use a fiber-based star topology, we've set our network up to be ATM-ready, once that technology becomes more mainstream.

SS: Can you describe your philosophy about local vs. distributed. vs. centralized data storage?

There are always tradeoffs in this discussion. We have architected our environment to use centralized file servers because of the many efficiencies gained: backups are faster and easier because there are fewer places to have to run them, and in the case of the binary servers, we have only 2 systems to update when we make application software changes instead of 200! The amount of administrative hours saved here is tremendous, not to mention the peace of mind that comes from simple revision control and the integrity of stable software configurations.

Of course, people will argue that you give up a lot of performance doing so much I/O over the network. And in terms of the conventional networks that most companies have implemented, they're right. So if you're going to centralize, then your LAN had better have plenty of performance *and* bandwidth. The high-speed switching hub network and server architecture we've implemented puts desktop network I/O to and from the servers on a par with local

disk I/O. So in our case, we get all the benefits of a centralized architecture without the performance penalties.

SS: What does your printer environment look like?

We're trying to centralize our printer environment, too. We hook printers to desktop stations only in cases where we have old devices that must interface that way. In all other cases, we hook them to central printer server nodes or hang them right off the network.

Each desktop system spools to a centralized system (a 700 Series machine) which in turn spools out to the appropriate location. This scheme keeps most of the printer configuration support in one place. Desktop users issue the standard LP spool commands; the central machine moves the request to the appropriate device or another machine.

SS: Can you describe your backup strategy?

We run daily backups to DAT tape directly on our data servers using Omniback and an autochanger. The most common use of these backup tapes is to restore directories that our users have accidentally deleted or corrupted. As for our binary servers, we take a snapshot of their contents monthly, and we back them up each time we release new software.

SS: How do you authenticate your users on your networked computers?

We use NIS to maintain a site-wide registry of users in our environment. We still use the Domain/OS registry for our Apollo DOMAIN environment and ultimately it will derive all of its information from NIS. We've begun to implement things like password aging and using "crack."

SS: What communication services do you support between your users and between your users and their associates?

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CIRCLE 64 ON READER SERVICE CARD

Our company is on the Internet and we use *sendmail* as our Internet mailer. There is limited FTP access outside the company; we're in the process of building a firewall, and we'll keep our outside contact minimal until we've completed this task. Our location's campus network provides PCs and Macs with access to WWW browsers, but our EWS system does not currently have WWW access in

place for our workstations. ■

Lisa Zahn is vice president of Ibis Communications Inc., a technical documentation and training consulting firm. She was one of the first five technical writers at Apollo Computer, Inc. and was a Learning Products manager at HP's Chelmsford, Massachusetts facility for several years before forming Ibis.

Hardware Review

by Sean Reifschneider

What Makes a Good X Terminal?

At-a-Glance

Hewlett-Packard ENVIZEX 20CpS

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Documentation

HP Enware X Terminal Manager
Technical Reference, 250 pages
Administrators' Guide, 110 pages

What do you do when you need more than an ASCII terminal but don't want to put a workstation on every desk? That's the question that X terminals were designed to answer. The theory is that by making a dedicated device that is just able to run the X Window server (and perhaps some clients) and communicate with the network, you can drive up performance and drive down costs.

Though some would argue the performance point, I consider the ease of administration to be one of the most important benefits of an X terminal. Let's face it: if the fight was one of sheer bang for the buck, the object would be to beat a PC-compatible turning out twice the XStones for less money.

Though many X terminals are quite "dumb" devices, the HP ENVIZEX has more features than some low-end workstations. The 220,000 XStones under the hood should keep power users quite happy. The ENVIZEX has a large set of options that can increase usability. Standard and optional hardware allow you to place floppy drives, printers, and even scanners where people need them, while not incurring a cost for those who don't. CSLIP support even allows placement of the terminal in locations without a network connection.

Features

If you're buying an ENVIZEX, you obviously have a need to run an X server. If that's all you use it for, you're missing the best part (not that you won't be happy).

For networking, the ENVIZEX can run 10baseT, 10base2 (thin net), AUI, or

optionally can be set up with 100VG-AnyLAN. SLIP/CSLIP support is included as are two serial ports for running X across a modem. Without X11R6 and its "Low Bandwidth X," that's not likely to be a good use of the ENVIZEX though.

A wide array of keyboard choices is available—HP-HIL, PC PS/2, Sun (type 4 or 5), DEC, or IBM 3270 styles. 1280x1024 graphics are available in either 19-inch greyscale or 17-, 19-, and 21-inch 8-bit color models with power savings (with 220,000 XStones for the 'p' series terminals).

For local printing, a parallel port is available. Memory is expandable to 102 MB using 3-SIMM modules.

Options include audio I/O, 1.44-MB floppy drive, SCSI interface for local scanner, Token Ring (4-MB/16-MB) networking, and a type III PCMCIA port.

Usability

HP claims 220,000 XStones and my tests came close enough to this with 207,992, which for comparison makes it roughly 30 percent faster than a 712/60 at about the same price. While the ENVIZEX scored much better, the 712 was 85 percent faster at lines, 89 percent faster at arcs, and 118 percent faster at text. The ENVIZEX turned out 55 percent more fillStones, 143 percent more blits (memory to display copies such as scrolling), and 14 percent more complexStones.

You'd have to be a very heavy graphics user to make use of all these stones. My testing included lots of graphics manipulation, text scrolling, and editing. The terminal really is meant for doing CAD/CAM and GIS work.

Administration was a joy. Total time for installation was about an hour, including unpacking the hardware and setting

it up, loading server and Enware software, and configuration. In a good day the average person could probably install 12 to 15. The Enware software set up everything with minimal fuss, including configuring TFTP (which wasn't previously set up) for the boot process. On the terminal, the startup and configuration screens are GUI, which I found to be a nice touch.

The terminal will boot from several sources. BOOTP, TFTP, and NFS are included for booting off a file server in the network. A terminal can also boot off its local PCMCIA slot with a flash memory cartridge, or "peer booting" can be set up so a cluster of terminals can boot off one flash cartridge. Updating the server for a cluster can be as simple as changing a single cartridge.

I found the PS/2 style keyboard and mouse to be of reasonable quality and quite usable. On the down side, the monitor didn't have enough contrast for my taste, and in normal office lighting would bother my eyes. I also thought it was a poor decision to place the power switch at the bottom of the unit when used as a tower—I accidentally shut it down after 45 minutes of work on it. Also, I would have liked a network activity monitor since an X terminal is such a network-dependent device.

Documentation is exceptional for both the end user and the administrator (a book is included for each), but you may never need to use it. The terminal and associated software installed exactly as I had expected, and in the end I read only about three pages before the setup was complete. Scanning the documentation I found no obvious questions unanswered and I have the impression that substantial effort was spent on getting it right.

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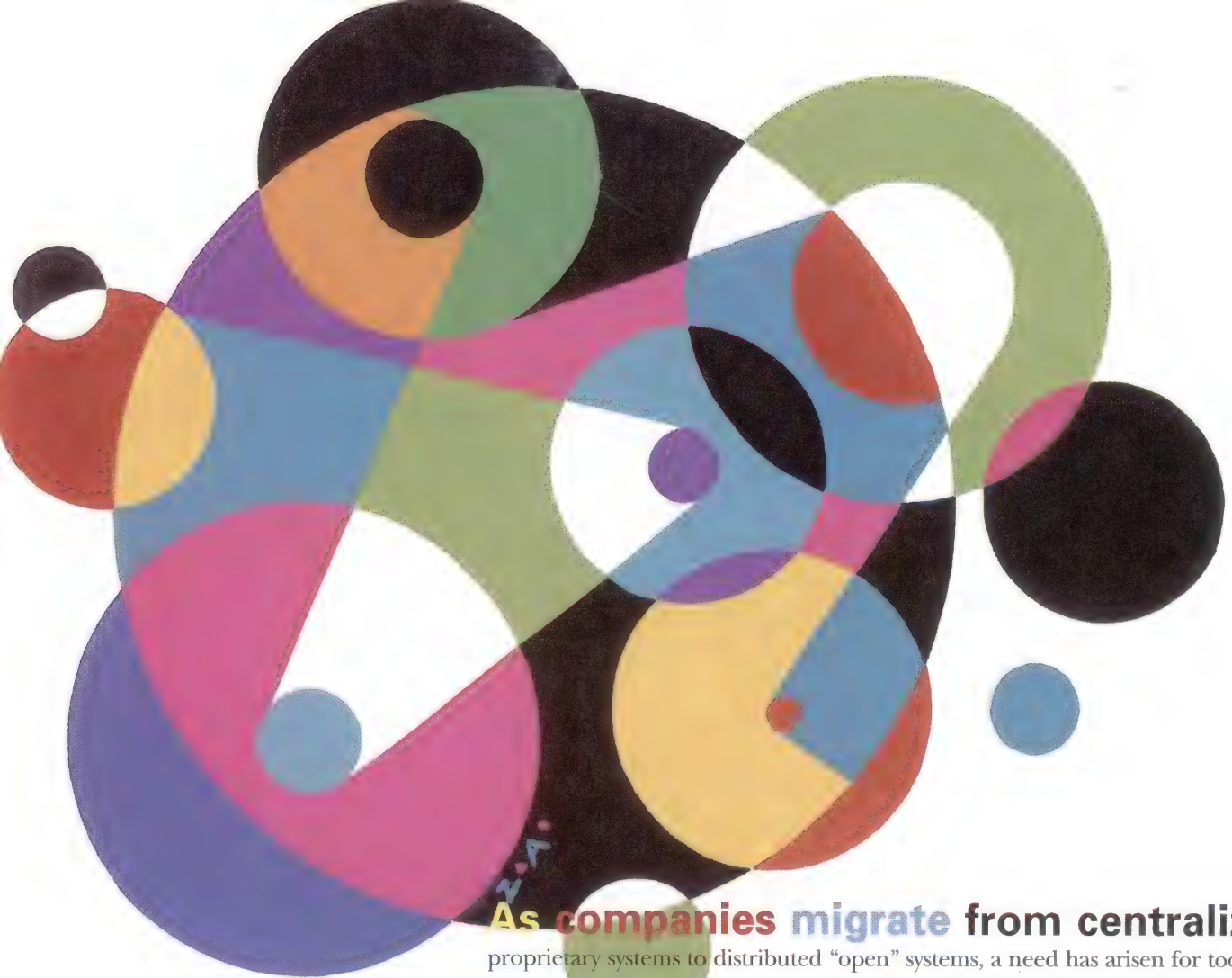
CIRCLE 65 ON READER SERVICE CARD

Summary

Despite its (mostly few and far between) shortcomings, the ENVIZEX 20CpS is a good X terminal for the money. If you have sensitive eyes, I'd highly recommend spending time making sure you can live with the monitor. The included administration software is exceptional and, along with the large number of optional extensions,

is what sets the ENVIZEX apart from otherwise very similar offerings from other manufacturers. ■

Sean Reifschneider <jaf@Tummy.com> is based in Colorado. He specializes in HP-UX systems administration and portable C programming. Mainly he's just enjoying working with computers and the people who work with them.



As companies migrate from centralized

proprietary systems to distributed “open” systems, a need has arisen for tools that allow centralized management of distributed systems. As the number of systems increases and their geographical distribution widens, core system administration activities such as backup, restore, user maintenance, and security checking become unmanageable. System administrators need a secure, reliable mechanism to perform these activities efficiently and effectively from a remote location. In this article we will discuss and demonstrate several architectures of remote system management tools for UNIX environments. We will discuss the major considerations, such as security, reliability, and maintainability, associated with each design. We will provide example code where relevant and will construct a basic tool from standard UNIX functions.

Today’s applications are designed to take advantage of many different resources spread across a network (the application on the desktop, a workgroup compute server or a print server in the local office, a corporate database at headquarters). To work reliably (or at all) these applications require a stable, functioning foundation. This foundation includes not only the local computer hardware and operating system, but also functioning local and wide-area networks, functioning remote servers, and the services the remote servers provide. A network database server, for example, must have not only running hardware and OS but also a functioning database engine with a working network connection. Today, a machine is not “up” unless the service it is supposed to provide is available.

Not long ago, a company with a UNIX system managed by hiring a UNIX guru. The UNIX box and its attendant were hidden off in some dusty corner of the office, while the “real” business machines were kept locked behind glass walls and run by an army of ITC people. Today, most of a company’s computing power is found on desks, in closets, and occasionally in computer rooms. This dispersion

Building a Tool for Remote UNIX Administration

of computing resources has increased the complexity of system management. The increased complexity of today's applications has increased the management load still further. In addition, today's business environment has forced many IT departments to limit or even reduce staffing.

Standard system management practices involve performing a set of tasks on the managed machine. A task might be to perform a backup, add a user account, or check that the printer queue is working. In a distributed environment, you need to do all of the tasks repeatedly on each machine administered. In addition, the system boundaries are extended out beyond the "pizza box," beyond the "glass house," and often beyond the borders of the building. (See *Figure 1*.)

For example, suppose we are performing regular backups, disk space monitoring, user administration, and print management on three UNIX workstations. This gives us a total of 12 daily

tasks. If we add two new workstations, our task count jumps from 12 to 20.

So the question facing system and network managers everywhere is, "How do I manage my users' machines with only 24 hours in the day and the machines scattered to the four winds?" The answer is a combination of smart processes and some simple tools.

Requirements

Distributed UNIX administration tools must meet the following three requirements:

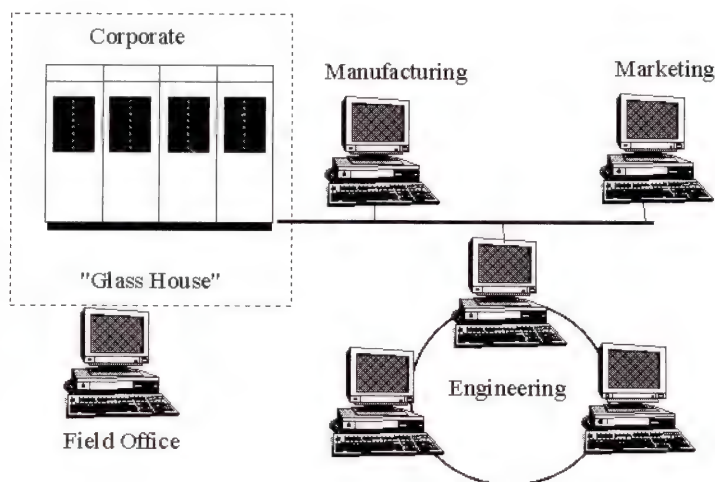
- Must handle standard system administration functions. These include such broad categories as backup and recovery, account maintenance, queue management, disk management, security monitoring, and process management.
- Must be able to perform these functions on many remote machines from one "management console." Tasks may be run on one machine at a time or on many machines simultaneously.

by Jeff Hodges,

Bobby Siu, and

Mike Milkovich

FIGURE 1



The remote machines may be of the same type or of many different types, depending on the environment.

- Must provide security equal to or greater than the standard access methods of telnet and rsh/rxexec.

In addition, the following abilities are highly desired:

- The monitored systems should be self-maintaining and self-scheduled. They should not have to wait for instructions from the master system.
- Monitored systems should run on an exception basis: the system manager should be alerted only if the problem cannot be handled automatically.
- There should be an easy way to extend the capabilities of your tools. You should be able to add tasks to an already managed machine or extend your toolset to a new machine.
- You should have the ability to maintain consistent versions of software, scripts, and data and control files on each system monitored.

Once you have a “framework” with the capabilities listed above, you can start building your new system management processes to take advantage of your new framework.

Architecture

The basic model for remote operation is a client-server model. In this case, the “client” is the management station, and the “server” is the managed machine. In a typical environment, you will have many managed servers, and a few (or only one) management clients. To execute administrative tasks, the client contacts the server and issues a request for

the server to execute the task. The server then validates the client and attempts to execute the task. The results of the task are gathered and sent back to the client.

The Management Environment

In the management environment, our toolset has four functional areas: the actual tasks to be executed, communications and security, execution control and evaluation, and scheduling.

Tasks

A task is simply some administrative or system management duty you want to perform. For many system management tasks, you can automate the drudge work, freeing yourself to concentrate on the more interesting parts of the system (i.e., the broken parts). We use the word “task” to mean either an administrative duty or a script, command, or program we have written to perform that duty. An automated task might be as simple as “watch the disk space usage on the root drive and scream when it gets above 95 percent used,” or it might be as complex as “check that the accounting department can access the customer database with a reasonable response time. If not, fix it.” Depending on the capabilities of your server, you might have tasks that automatically run at a given time (self-initiating tasks), tasks that run only if a certain set of circumstances are true (threshold-initiated tasks), or tasks that take actions on other machines (proxy tasks).

Communications and Security

There are many communications methods to choose from, including *remsh/rxexec*, Berkeley sockets, and RPCs. Each of these methods has advantages and disadvantages; the method

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you choose will depend on such factors as ease of use, level of security, portability, network overhead, and reliability. You will also need to decide if you want to send a full UNIX command line across the network, just a request for a task, or some combination of task name and command parameters.

remsh/rexec. *remsh* and *rexec* are probably the simplest to use and run on many platforms. However, they are relatively insecure, and performing complex tasks is nontrivial. These tools are easy to write and maintain, and can often be pulled together from the scripts and tools you already have. The security risk for *remsh* lies in the fact that if the management node is compromised by a hacker, then all of the managed nodes are accessible. *rexec* is more secure in this regard, but it fails, too, because it sends the user's password in clear ASCII text when it requests that a task be executed. If you're developing tools for a small group, the functions you want to automate are relatively straightforward, and you can live with the potential security problems, this method is probably the way to go. (For an introduction to the problems and solutions to *remsh* security, and system security in general, see *Practical UNIX Security*, by Simson Garfinkel and Gene Spafford, O'Reilly & Associates, Inc., 1991. ISBN 0937275-72-2.) *Listing 1* demonstrates one of the potential security risks for systems using the *rexec* functions.

Sockets. Berkeley sockets have the advantage of being extremely portable and flexible, and they give the programmer substantial control. However, they require significant engineering investment up front. The application is responsible for handling the data transfer from client to server. If you are developing

LISTING 1 LAN Probe output demonstrating a potential rexec security hole

```
Pkt# 4 Len: 64/64 Thu Jul 14 14:11:19 1994 PDT
Ethernet: (0x080009273e24 -> 0x080009627490) type: IP(0x800)
Internet: 15.3.33.201 -> 15.3.33.148 hdr len: 5
  ver: 4 total len: 45 TypeofService: 0 Precedence: (Routine)
  Nrml Reliability Nrml Thruput Nrml Delay id: 0xe681 fragoff: 0
  Time To Live: 30
  flags: 00 (May frgmt, Last frgmt) prot: TCP(6)
  prot: TCP(6)
TCP: 1853 -> rexec(512) seq: 464d1207
  ack: 75f63e01 win: 8192 hl: 5 xsum: 0x36f8 urg: 0
  flags: <ACK><PUSH>
  data (5/5): root.
*-----*
Pkt# 5 Len: 78/78 Thu Jul 14 14:11:19 1994 PDT
Ethernet: (0x080009273e24 -> 0x080009627490) type: IP(0x800)
Internet: 15.3.33.201 -> 15.3.33.148 hdr len: 5
  ver: 4 total len: 60 TypeofService: 0 Precedence: (Routine)
  Nrml Reliability Nrml Thruput Nrml Delay id: 0xe682 fragoff: 0
  Time To Live: 30
  flags: 00 (May frgmt, Last frgmt) prot: TCP(6)
  prot: TCP(6)
TCP: 1853 -> rexec(512) seq: 464d120c
  ack: 75f63e01 win: 8192 hl: 5 xsum: 0xe2b8 urg: 0
  flags: <ACK><PUSH>
  data (20/20): $4me4fun./bin/ps -ef.
*-----*
```

tools to be used for enterprise-wide management, you will probably consider using a socket-based communications system. (See the book *UNIX Network Programming*, by W. Richard Stevens, Prentice Hall Software Series, 1990. ISBN 0-13-949876-1.)

Remote Procedure Calls. Remote Procedure Calls (RPCs) are built upon Berkeley sockets and thus have the same advantages, but RPCs provide a layer of insulation above the actual network calls. The goal of RPCs is to minimize the difference between local and remote calls. Programmers need only define the protocol with which the client and server will communicate, and the RPC API will generate the stub procedures. The major disadvantage of RPCs is the lack of standardization. A number of companies have developed RPC implementations such as "NCS RPC," "Courier RPC," "OSF DCE," and Sun's "RPC 4.0." In order to write a reliable RPC application one must ensure that both the client and

server are using the same version of RPC. For a large application this may entail patching hundreds of server nodes. (For more information on RPC see *Power Programming with RPC*, by John Bloomer, O'Reilly & Associates, 1992. ISBN 0-937175-77-3.)

Both RPCs and BSD Sockets have the advantage of increased security because the protocol is programmer-defined. A hacker would need to know some underlying details of the application to break into the system. A programmer could further complicate the hacker's life by encrypting some or all of the data in the packets. Programmers could also use a reference table of keys for each task to execute. Rather than sending the actual command across the network, a corresponding key value known only to the server and client could be sent. Upon receipt of the value, the managed node would then refer to a table with the actual command. *Listing 2* illustrates this principle.

Continued on Page 30

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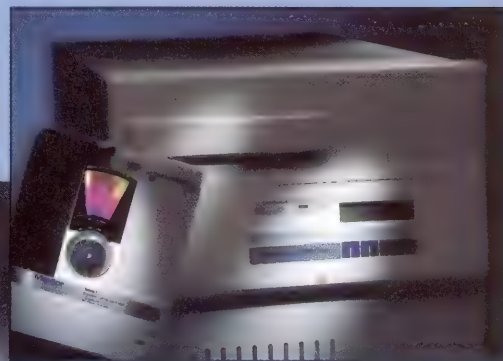
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LISTING 2 An example of using a key reference table

```

Pkt# 26 Len: 171/171 Thu Jul 14 17:15:25 1994 PDT
Ethernet: (0x08000962dd3e -> 0x08002008cf27) type: IP(0x800)
Internet: 15.3.33.146 -> 15.3.33.208 hdr len: 5
ver: 4 total len: 153 TypeofService: 0 Precedence: (Routine)
Nrml Reliability Nrml Thrput Nrml Delay id: 0xfb34 fragoff: 0
Time To Live: 30
flags: 00 (May frgmt, Last frgmt) prot: TCP(6)
prot: TCP(6)
TCP: 3987 -> 5557 seq: 4ba92401
ack: 32c31e01 win: 8192 hl: 5 xsum: 0x71d4 urg: 0
flags: <ACK><PUSH>
data (100/113):.....m.....!...0...6...E...R...c....<9/3/360
425.....15.3.33.146....774231832....TASK1000000
*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*

```

Execution Control and Evaluation

The management station must have the ability to control the execution of the task on the managed node, as it would a task running locally. It must be able to start, stop, and evaluate the results.

remsh provides the ability to start and stop processes in the same fashion as one would do locally. However, *remsh* does not give you the exit code of the remote process, so you need to write an output parser to determine the results. This parser can be a simple customized *grep* for a key word or phrase, or a generic, reusable, configurable regular expression parser.

Sockets and RPC calls give you the ability to collect output as well as exit codes from a process, and in addition, give you job control (signals, stopping and starting the process, and so on). Since you have more control over the data flow to and from the process, it is possible to have a customized "interaction" with a process (an example is an expect script). You can also evaluate the output from the process "on the fly," letting you take immediate action for a given output. For example, you can watch a backup script running, and when this backup script puts out the message, "end of this tape. insert another," your monitoring routine can run another program that causes an autochanger mechanism to change the tape.

Task Scheduling

Task scheduling is the ability to schedule the execution of a task at a predefined time or interval. For example, you may wish to perform a backup every night at 2:00 a.m. or to check for security violations every 30 minutes.

Task scheduling is desirable because it:

- *Reduces the chance for human error.* Humans are not adept at performing repetitive tasks. When a human is faced with performing the same task time and time again, the chance that

he will make a mistake increases each time.

- *Reduces cost by eliminating manual labor.* The cost for human labor is constantly rising. By reducing the need for manual labor, cost savings can be realized today and in the future.

Task scheduling can be achieved by utilizing a scheduling facility, such as *cron*(1M), on the management station or the managed systems.

Task scheduling control can be placed on the management station side by placing the entire task execution request in the *cron* file on the management station. For example, if we wanted a backup to be performed on systemX every night at 2:00 a.m., we could add the following to the management station's *cron*/scheduling facility:

```
"0 2 * * * remsh systemX -l root /bin/doBackUp"
```

Task scheduling control can also be placed on the managed systems to distribute the control to them. For example, the following can be added to each managed system's local file:

```
"0 2 * * * /bin/doBackUp"
```

The advantage of centralizing all scheduled task control on the management station is that it is easy to maintain. There is a single local file to maintain. The disadvantage is that this method increases the amount of network traffic because all requests to execute a task must be sent across the line from the management station to the managed systems; additionally, if the line becomes unavailable, the scheduled tasks cannot be invoked.

Distributing scheduling control to the managed systems requires less network bandwidth than centralized control and provides the added benefit that scheduled tasks will still be invoked if the network becomes unavailable. The disadvantage is that it can be more difficult to manage the distributed configuration.

A Basic Tool

To illustrate the components we have discussed, we will now build a basic remote UNIX administration tool. For simplicity, we will use the *remsh* mechanism as the communications/security component. Execution and evaluation will be handled by a combination of *remsh* features and a custom script. For scheduling we will use the local *cron*(1M) feature and a scheduling script.

Continued on Page 32

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Establishing Communication

The management station is responsible for the execution and evaluation of all of the tasks run on the managed nodes. To allow the management station this functionality we will need to do the following:

- Enable the *remshd* process on all managed machines.
- Add the user *ruxad*, with a user id of 0, and a home directory of */tasks* to all of the managed machines.
- Create the directories *bin*, *scripts*, *data*, and *cntl* in the *ruxad* user's home directory.
- Create the file *.rhosts* in the *ruxad* home directory and make the following entry: *<Management Station> ruxad* where *<Management Station>* is the hostname of the system executing the tasks. For example:

```
hpnst123 ruxad
```

Now that we have the communications mechanism in place, we can add the execution and evaluation component.

Executing and Evaluating

Since we are using the *remshd* mechanism, we will need to encapsulate the output of our managed nodes' tasks. This will allow us to take specific actions based on the exit values of the process we are running. We will also want to execute tasks on multiple systems at a time. Listing 3 displays the controlling process *Rem_run*.

It is clear from the example that we could extend *Rem_run* to take specific actions based on the exit status of the remotely executed function. This architecture requires that we encapsulate the

LISTING 3 Rem_run: an example controlling process

```
#!/bin/ksh
#####
#
# Module Name: Rem_run
#
# Purpose:
# The purpose of this script is to execute a command on a number
# of #remote systems. The output of the command executed will be
# searched for #the keywords "Informational:" "Warning:" and #
# "Critical:". If the #keywords are found in the stderr output
# of the command executed, an #error message will be returned
# from this script.
#
# Parameters:
# -h = Names of the systems where the command will be run on.
# -c = command to be run
#
# Exit Codes:
# 0 = Success
# 1 = Informational
# 2 = Warning
# 3 = Critical
# 9 = remsh failed
#
# Example Usage:
# Rem_run -h "hpnst sage basil" -c "/bin/ps -ef"
#
#####

#set -x
set -u

#####
#
# Function Name: monsh
#
# Purpose:
# The purpose of this function is to execute a command on a
# remotely #managed system. The output of the command executed
# will be searched for #the keywords "Informational:" "Warning:"
# and "Critical:". If the #keywords are found in the stderr
# output of the command executed, a #return code of 1, 2, or 3
# will be returned from this script.
#
# Parameters:
# $1 = Name of the system where the command will be run on.
# $2 = Command to be invoked
#
# Exit Codes:
# 0 = Success
# 1 = Informational
# 2 = Warning
# 3 = Critical
# 9 = remsh failed
#
# Example Usage:
# monsh hpnst checkDisk
#
#####

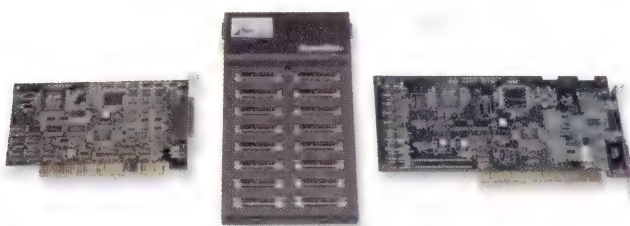
monsh()
{
  INFO="Informational:"
  WARN="Warning:"
  CRIT="Critical:"

  SYSTEM=$1
  CMD=$2
  OUT="/tmp/job.stdout"
  ERR="/tmp/job.stderr"
  TMP="/tmp/job.output"
```




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LISTING 3 *Rem_run: an example controlling process, continued*

```

/usr/bin/remsh $SYSTEM -l ruxad "$CMD" > $OUT 2> $ERR
if [ $? != 0 ]
then
return 9
fi

grep $CRIT $ERR > /dev/null
if [ $? = 0 ]
then
echo "$CRIT $SYSTEM $CMD Failed!"
return 3
fi

grep $WARN $ERR > /dev/null
if [ $? = 0 ]
then
echo "$WARN $SYSTEM $CMD Failed!"
return 2
fi

grep $INFO $ERR > /dev/null
if [ $? = 0 ]
then
echo "$INFO $SYSTEM $CMD Failed!"
return 1
fi

cat $OUT
return 0

}
#####
# Main
#####
NUM_ARGS=0
HOSTFLG=0
CMD_FLG=0
USAGE_MSG="Usage: $0 -h hosts -c command "
while getopts :h:c: option
do
case "$option"
in
h) MACHINES=$OPTARG
HOSTFLG=1;;
c) CMD=$OPTARG
CMD_FLG=1;;
) echo $USAGE_MSG
exit 1;;
esac
done

# Check that all required parms have been supplied
if [ $HOST_FLG -lt 1 ]
then
echo $USAGE_MSG
exit 1
fi

if [ $CMD_FLG -lt 1 ]
then
echo $USAGE_MSG
exit 1
fi
for HOST in $MACHINES
do
monsh $HOST "$CMD"
done
exit 0

```

LISTING 4 *Scheduling example*

```

#!/bin/ksh
#####
#
# Name:
# updateCron
#
# Purpose:
# The purpose of this script is
# to update a cron file on a remote system.
#
# Parameters:
# -c = Entry to be added to the cron file.
#           eg "0 2 /bin/doBackup"
#
# Exit Codes:
# 0 = Success
# 1 = Failure
#
# Example Usage:
# updateCron -c "0 2 /bin/doBackup"
#
#####

CMD_FLG=0
USAGE_MSG="Usage: $0 -c command "
while getopts :c: option
do
case "$option"
in
c) CMD=$OPTARG
CMD_FLG=1;;
) echo $USAGE_MSG
exit 1;;
esac
done

# Check that all required parms have been supplied
if [ $CMD_FLG -lt 1 ]
then
echo "Critical Error:$USAGE_MSG"
exit 1
fi

TMP="/tmp/cronfile.old"
crontab -l > $TMP
echo "$CMD" >> $TMP
crontab $TMP
if [ $? != 0 ]
then
echo "Critical Error: updateCron failed..."
exit 1
fi
exit 0

```


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CIRCLE 15 ON READER SERVICE CARD

output of each remotely executed script, but with the added control the effort should be worth it.

Executing on Time

In order for the system to be fully functional, we will need the capability of scheduling the execution of the remote tasks. To reduce the amount of network traffic required and the dependence on the management station, we will use the managed systems' *cron*(1M) function and the script in *Listing 4*.

It is obvious that this script would need to be on the system prior to using it through *Rem_run*. To accomplish this we could simply ftp the script to each system we are using, or we could make use of the remote copy (*rcp*) function. Using *rcp* we could automatically update all of the systems we are managing. The code fragment below illustrates the use of *rcp* for software distribution.

```
#
# Example to redistribute all the tasks for ruxad
#
MACHINES="hpnst hpnst123 hprew"
DIR=/tasks
for HOST in $MACHINES
```

```
do
/usr/bin/rcp -r $DIR $HOST:$DIR
done
```

Conclusion

Remote UNIX administration is a very complicated process; system administrators are faced with obstacles never encountered in the traditional "glass house." If system administrators are to be successful in their function, they will need to employ some sort of administrative tool. In the preceding pages, we discussed the major requirements of such a tool, some possible architectures, and a basic tool to learn from. ■

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Where Are Your HP-UX System Resources Going? Part 1

in this article we'll cover some techniques for determining how your HP-UX system resources are being used. The same principles apply when determining how system resources are being used regardless of whether you are running HP-UX 9.x or 10.x.

In this article we get into some of the gray areas of system administration. System resource utilization and performance monitoring are less straightforward endeavors than traditional system administration functions such as system setup and loading software. You play detective some of the time when determining how system resources are being used and sometimes you guess at what is taking place. That's the reason I think this is where the fun begins as a system administrator.

When determining where system resources are going, I often find system administrators dealing with their computer systems as systems for the first time. Computer systems are too often thought of as independent components. What may look like the source of a system bottleneck may just be a symptom of some other problem. Keep in mind that components of the system work together; a small problem in one area may manifest itself as a bigger problem in other areas. I'll provide some examples of what to look for throughout this article, but keep in mind your system is indeed unique. You have to consider your environment as you use the tools described here.

Understanding where your HP-UX system resources are going is indeed an art. There are great built-in HP-UX commands such as `iostat` and `vmstat`. Built-in HP-UX accounting helps you track user and application information over time. There are also some fine performance monitoring tools such as HP GlancePlus/UX and HP PerfView.

Why is it so difficult to determine where your system resources are going if there are so many great tools to assist you? To begin with, this is the information age. No one knows better than those of us who deal with information systems that the problem is that there

by Marty Poniatowski

is too much information. This can be the problem when you try to determine where your system resources are going. You may end up gathering information about your system in off hours when it is not in use, thereby getting erroneous results. You may end up with long accounting reports with too much data to digest. You may end up with so many network statistics that a fleet of system administrators wouldn't have time to analyze it, let alone one overworked, albeit enthusiastic, administrator.

Since every system and network is different, I can't recommend just one approach to determining where your system resources are going. I can recommend, however, that you understand all of the tools I cover here and then determine which are best suited for your environment. You may decide that you can get all the information you need from the built-in HP-UX commands. You may, on the other hand, determine that you need the best performance tools available. Once you know what each of these techniques does and does not offer, you will be in a much better position to make this decision.

System Components

Now the big question: What are the components of your system? At one time we viewed the components of a system as:

- CPU
- Memory
- I/O

Well, like all things in this world, system components have become more complex.

All of the components of your system work together, or in some cases against one another. You must, therefore, take an inventory of system components before you can begin to determine how your system resources are being used. Here is an example of a more current list of system components:

1. Applications

- local—These applications run locally and don't rely on other systems for either the applications or data.
- remote—These applications either run remotely or are copied from a remote system to a local system and then run locally. I consider both of these remote applications because an application that has to be copied to the local system before it is run consumes a lot of networking resources, sometimes more than an application that runs remotely would consume.
- license servers—Many applications require license servers to be running to ensure that you have a license available for a user who wants to run an application. In a distributed environment you may have an application with several license servers running so that if one or two license servers go down, you still have a third license server running. Because you can have many license servers running for many applications, these may be consuming substantial system resources.

2. Data—Listing your data as a system resource may be a surprise to you. I think, however, that since most computers and applications are a means to create the data that keeps your company in business, you should indeed consider it as a system resource. In some cases, system and database administrators spend many hours planning how data will be stored in order to achieve the fastest response time. In a distributed engineering application the location and number of data servers can have a major impact on overall system and network performance. In this respect data is indeed a system resource.

- local data—On local system, consumes primarily system resources.
- remote data—On remote system, consumes resources on local system, remote system, and network.

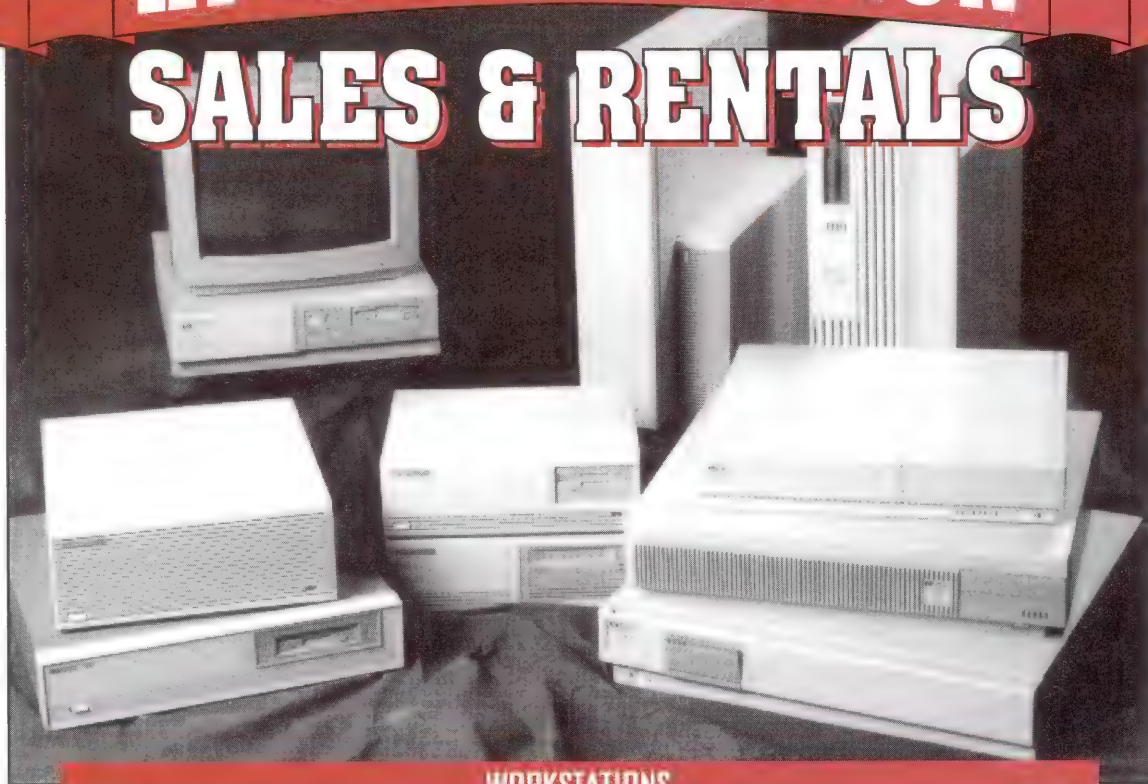
3. Windowing environment and user interface

X, Motif, HP VUE—You will want to take a close look at the amount of system resources that can be consumed by X, Motif, and HP VUE.

4. Networking—Networking is the perceived or real bottleneck in more and more installations. Because of the increasing demand placed on networking resources by client-server applications and other distributed environments, you need to have an understanding of the amount of networking resources your system is consuming and how busy your network is in general. Because I don't cover such advanced network management tools as HP OpenView in this article, we are going to take a look at the commands you can issue to see how busy the network interface is on a particular system and get an idea of the

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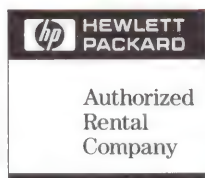
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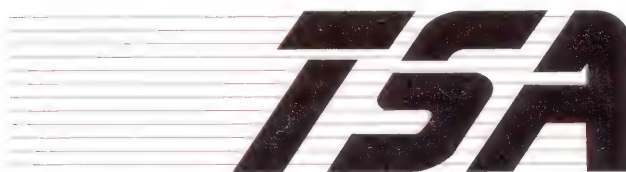
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overall amount of traffic on the network.

5. CPU—Of course the CPU is a system resource. I just chose not to list it first because until you know how your system is set up in terms of applications, data, user interface, etc., it is pointless to start looking at the CPU.

6. Memory—Memory is the system resource I find most often needs to be increased. What looks to be a shortage of CPU capacity sometimes turns out to be a lack of memory.

7. Input/Output (I/O)—The real question with I/O as a system resource is, How long does it take to get my applications or data to and from disk? We'll look at various ways to see what kind of I/O activity you have going on.

Commands and Tools for Determining How System Resources Are Being Used

There are a variety of approaches you can take to determine how system resources are being used. These choices range from quick snapshots that take but a few seconds to create, to long-range capacity planning programs that you may want to run for weeks or months before you even begin to analyze the data they produce. The diagram in *Figure 1* shows some commonly used techniques for determining how system resources are being used. We'll cover two of these techniques:

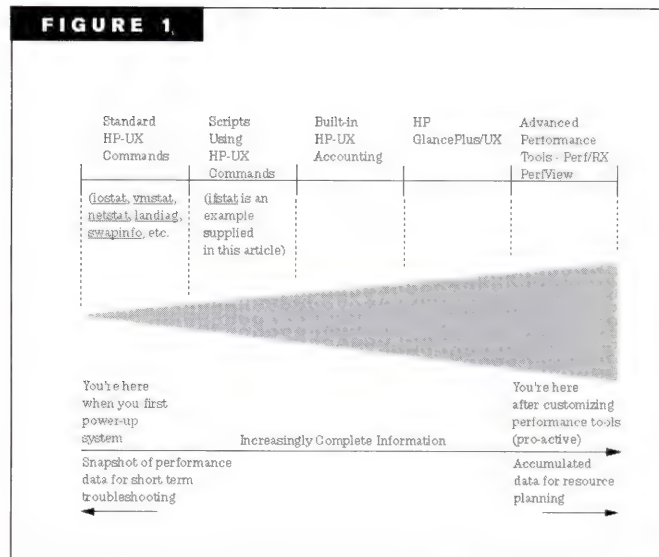
1. Introducing some standard HP-UX commands that give you information about system resources. You can also include these commands in shell scripts, which gives you custom commands.
2. Using the performance monitoring tool HP GlancePlus/UX.

Taking Inventory

In an existing computing environment it is essential first to take an inventory of your computing resources before you begin to determine the level of system resources. The minimum you should include in this inventory are the system resources I listed earlier (applications, data, user interface, etc.)

There are degrees to which you can take an inventory. You

FIGURE 1



may choose a high-level inventory with little detail that is simply a drawing of your network including systems and major software. A highly detailed inventory, on the other hand, might be a detailed network diagram including all of the hardware components in each system and a detailed list of software including what data is located on what disks, and so on. The granularity of your inventory depends on what you would like to accomplish. If your goal is to visualize which systems are used for which purpose, then a high-level network diagram may be sufficient. If you need to troubleshoot a disk I/O problem, you may need to produce a detailed inventory of a system including the files and directories located on each disk.

Standard HP-UX Commands

To begin with, let's look at some commands you can issue from the HP-UX prompt to give you information about your system. The commands I'll cover are:

- *iosat*
- *vmstat*
- *netstat*
- *ps*
- *swapinfo*
- *showmount* and *mount*

We'll first look at each of these commands so you get an understanding of the output produced by each and how this output may be used. In Part 2 of this article we'll use some of these commands in conjunction with HP GlancePlus/UX to help uncover an interesting performance problem.

Continued on Page 42

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I/O and CPU Statistics with *iostat*

The *iostat* command gives you an indication of the level of effort the CPU is putting into I/O and the amount of I/O taking place among your disks and terminals. The example in the box below shows the *iostat -t* command, which will be executed every three seconds, and associated output from an HP-UX system. The “#” shown is the HP-UX prompt.

```
# iostat -t 3
```

tty			cpu			
tin	tout		us	ni	sy	id
78	42		2	0	28	70
/dev/dsk/1s0			/dev/dsk/4s0			
bps	sps	mmps	bps	sps	mmps	bps
0	0	0	33	8.3	25.2	7

tty			cpu			
tin	tout		us	ni	sy	id
66	24		0	0	30	70
/dev/dsk/1s0			/dev/dsk/4s0			
bps	sps	mmps	bps	sps	mmps	bps
5	12	15.9	36	9.7	21	7

tty			cpu			
tin	tout		us	ni	sy	id
90	29		1	0	25	73
/dev/dsk/1s0			/dev/dsk/4s0			
bps	sps	mmps	bps	sps	mmps	bps
12	1.7	15.5	24	3	19.1	14

Here are descriptions of the reports you receive with *iostat* for terminals, the CPU, and mounted file systems:

For every terminal you have connected (tty), you see a “tin” and “tout”, which represent the number of characters read from your terminal and the number of characters written to your terminal, respectively. The *-t* option produces this terminal report.

For your CPU, you see the percentage of time spent in user mode (“us”), the percentage of time spent running user processes at a low priority called nice (“ni”), the percentage of time spent in system mode (“sy”), and the percentage of time the CPU is idle (“id”).

For every locally mounted file system, you receive information on the kilobytes

transferred per second (“bps”), number of seeks per second (“sps”), and number of milliseconds per average seek (“mmps”). For disks that are NFS-mounted or disks on client nodes of your server you will not receive a report: *iostat* reports only on locally mounted file systems.

When viewing the output of *iostat*, you should take note of some parameters.

First, note the time your CPU is spending in the four categories shown. I have worked on systems with poor performance that the administrator assumed to be a result of a slow CPU, when the “id” number was very high, indicating the CPU was actually idle most of the time. If the CPU is mostly idle, the chances are that the bottleneck is not the CPU but I/O, memory, or networking. If the CPU is indeed busy most of the time (“id” is very low), see if any processes are running “nice” (check the “ni” number). It may be that some background processes consuming a lot of CPU time can be changed to run “nice.”

Second, compare the milliseconds per average seek (“mmps”) for all of the disks you have mounted. If you have three identical disks mounted, yet the “mmps” for one of the disks is substantially higher than the others, then you may be overworking it while the others remain mostly idle. If so, distribute the work load evenly among your disks so that you get as close to the same number of accesses per disk as possible. Note that a slower disk will always have a higher “mmps” than a faster disk, so put your most often accessed information on your faster disks. The “mmps” for a disk is usually around 20 milliseconds, as in all three disks (1s0, 4s0, and 6s0) in the last example. A CD-ROM would have a much higher mmps of approximately 200 milliseconds.

Continued on Page 44

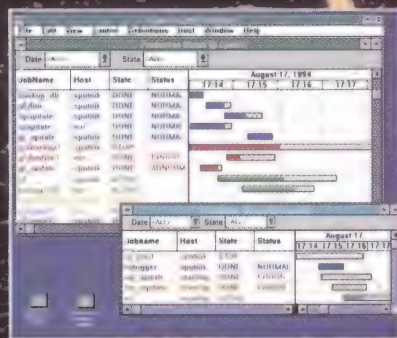
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Virtual Memory Statistics with *vmstat*

vmstat provides virtual memory statistics. It provides information on the status of processes, virtual memory, paging activity, faults, and the breakdown of the percentage of CPU time. In the example in the box below, the output was produced three times at five-second intervals. The first argument to the *vmstat* command is the interval; the second is the number of times you would like output produced.

You will get more out of the *vmstat* command than you want. Here is a brief description of the categories of information produced by *vmstat*:

```
# vmstat 5 3:
```

procs			memory		page		faults							cpu			
r	b	w	avm	free	re	at	pi	po	fr	de	sr	in	sy	cs	us	sy	id
4	0	0	1161	2282	6	22	48	0	0	0	0	429	289	65	44	18	38
9	0	0	1161	1422	4	30	59	0	0	0	0	654	264	181	18	20	62
6	0	0	1409	1247	2	19	37	0	0	0	0	505	316	130	47	10	43

Processes are classified into one of three categories: runnable (“r”), blocked on I/O or short term resources (“b”), or swapped (“w”).

Next you will see information about memory. “avm” is the number of virtual memory pages owned by processes that have run within the last twenty seconds. If this number is roughly the size of physical memory minus your kernel, then you are near paging. The “free” column indicates the number of pages on the system’s free list. It doesn’t mean the process is done running and these pages won’t be accessed again; it just means they have not been accessed recently. I suggest you ignore this column.

Next is paging activity. Only the first field (re) is useful. It shows the pages that were reclaimed. These pages made it to the free list but were later referenced and had to be salvaged. Check to see that “re” is a low number. If you are reclaiming pages that were thought to be free by the system, then you are wasting valuable time salvaging these. Reclaiming pages is also a symptom that you are short on memory.

Next you see the number of faults in three categories: interrupts per second, which usually come from hardware (“in”); system calls per second (“sy”); and context switches per second (“cs”).

The final output is CPU usage percentage for user (“us”), system (“sy”), and idle (“id”). This is not as complete as the *iostat* output, which also shows nice entries.

You want to verify that the runnable processes (“r”) value is higher than the blocked (“b”) value and runnable but swapped (“w”) processes value. If too many processes are blocked and swapped, your users will get a slower response time. In the example we’ll review later in this article you’ll see many swapped (“w”) processes and no runnable (“r”) or blocked (“b”) processes, indicating a great deal of swapping is taking place.

Whenever you see entries in the blocked (“b”) or runnable but swapped (“w”) columns, you see evidence that processes are standing still. You want to identify the source of the blocked and runnable but swapped processes. The reason will usually be insufficient RAM in your system. Swapped processes are those that have been moved from RAM

to disk in an effort to free up RAM for other processes. You may want to look at GlancePlus to do more detailed troubleshooting of memory under the “Memory Detail” screen.

Network Statistics with *netstat*

netstat provides information related to network statistics. Since network bandwidth has as much to do with performance as the CPU and memory in some networks, you want to get an idea of the level of network traffic you have.

There are two forms of *netstat* that I use to obtain network statistics. The first is *netstat -i* which shows the state of interfaces that are autoconfigured. Since I am most often interested in getting a summary of *lan0*, I issue this command. Although *netstat -i* gives a good rundown of *lan0*, such as the network it is on, its name and so on, it does not show useful statistical information.

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Here is the output of *netstat -i*:

```
# netstat -i
```

Name	Mtu	Network	Address	Ipkts	Ierrs	Opkts	Oerrs	Col
lan0	1497	151.150	a4410.e.h.c	242194	120	107665	23	19884

netstat doesn't provide as much extraneous information as *iostat* and *vmstat*. Put another way, most of what you get from *netstat* is useful. Here is a description of the nine fields in the *netstat* example:

Name	The name of your network interface (Name), in this case <i>lan0</i> .
MTU	The "maximum transmission unit," which is the maximum packet size sent by the interface card.
Network	The network address of the LAN to which the interface card is connected (151.150).
Address	The host name of your system. This is the symbolic name of your system as it appears in the <i>/etc/hosts</i> file.

Start of statistical information:

Ipkts	The number of packets received by the interface card, in this case <i>lan0</i> .
Ierrs	The number of errors detected on incoming packets by the interface card.
Opkt	The number of packets transmitted by the interface card.
Oerrs	The number of errors detected during the transmission of packets by the interface card.
Collis	The number of collisions (Collis) that resulted from packet traffic.

netstat provides cumulative data since the node was last powered up; you might have a long elapsed time over which data was accumulated. If you are interested in seeing useful statistical information, you can use *netstat* with different options. You can also specify an interval to report statistics. I usually ignore the first entry since it shows all data since the system was last powered up. This means the data includes non-prime hours when the system was idle. I prefer to view data at the time the system is working its hardest. This second *netstat* example provides network interface information every 5 seconds:

```
# netstat -I lan0 5
```

input		(lan0)	output		
packets	errs	packets	errs	colls	
14600725	14962	962080	0	9239	
217	0	202	0	2	
324	0	198	0	0	
275	0	272	0	3	

With this example you get multiple outputs of what is taking place on the LAN

interface. As I said earlier, you may want to ignore the first output since it includes information over a long time period. This may include a time when your network was idle and therefore the data is not important to you.

You can specify the network interface on which you want statistics reported by using **-I interface**; in the case of the example it was **-I lan0** with an interval of 5 seconds.

Analyzing *netstat* statistical information is intuitive. You want to verify that the collisions (Coll) is much lower than the packets transmitted (Opkts). Collisions occur on output from your LAN interface. Every collision your LAN interface encounters slows down the network. You will get varying opinions on what constitutes too many collisions. If your collisions are less than 5 percent of "Opkts" you're probably in good shape and better off spending your time analyzing some other system resource. If this number is high, you may want to consider segmenting your network in some way, such as by installing networking equipment between portions of the network that don't share a lot of data.

As a rule of thumb, if you reduce the number of packets you are receiving and transmitting ("Ipkts" and "Opkts"), you will have less overall network traffic and fewer collisions. Keep this in mind as you plan your network or upgrades to your systems. You may want to have two LAN cards in systems that are in constant communication. That way these systems have a "private" LAN over which to communicate and do not adversely affect the performance of other systems on the network. One LAN interface on each system is devoted to intrasystem communication. This provides a "tight" communication

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5	Any	Any	Any	drop	SnmpTrap	Gateways	

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path among systems that usually act as servers. The second LAN interface is used to communicate with any systems that are usually clients on a larger network.

You can also obtain information related to routing with *netstat*. The *-r* option to *netstat* shows the routing tables, which you usually want to know, and the *-n* option can be used to print network addresses as numbers rather than as names. In the following examples *netstat* is issued with the *-r* option (this will be used when describing the *netstat* output) and the *-rn* options so you can compare the two outputs:

```
$ netstat -r
Routing tables  Gateway      Flags      Refs      Use      Interface
Destination
-----
localhost      localhost    UH          0          28       lo0
default        router1      UG          0          0        lan0
128.125.61     system1      U           347       28668    lan0
```

```
$ netstat -rn
Routing tables  Gateway      Flags      Refs      Use      Interface
Destination
-----
127.0.0         127.0.0      UH          0          28       lo0
default        128.185.61.1 UG          0          0        lan0
128.125.61     128.185.61.2 U           347       28668    lan0
```

With *netstat* there is some information provided about the router, which is the middle entry. The *-r* option shows information about routing but there are many other useful options to this command. Of particular interest in this output is “Flags,” which defines the type of routing that takes place. Here are descriptions of the most common flags from the HP-UX manual pages:

- 1=U Route to a network via a gateway that is the local host itself.
- 3=UG Route to a network via a gateway that is the remote host.
- 5=UH Route to a host via a gateway that is the local host itself.
- 7=UGH Route to a host via a remote gateway that is a host.

The first line is for the localhost or loopback interface called

lo0 at address 127.0.0.1 (you can see this address in the *netstat -rn* example). The UH flags indicate the destination address is the local host itself. This class A address allows a client and server on the same host to communicate with one another with TCP/IP. A datagram sent to the loopback interface won’t go out onto the network, but simply through the loopback.

The second line is for the default route. This entry says send packets to router1 if a more specific route can’t be found. In this case the router has a UG under Flags. Some routers are configured with a U, others, such as the one in this exam-

ple, with a UG. I’ve found that I usually end up determining through trial and error whether a U or UG is required. If there is a U in Flags and I am unable to ping a system on the other side of a router, a UG usually fixes the problem.

The third line is for the system’s network interface lan0. This means to use this network interface for packets to be sent to 128.185.61.

Check Processes with *ps*

To answer the question, “What is my system doing?” use *ps -ef*. This command provides information about every running process on your system. If, for instance, you want to know if NFS is running, you simply type *ps -ef* and look for NFS daemons.

Although *ps* tells you every process that is running on your system, it doesn’t provide a good summary of the level of

system resources being consumed. The other commands we have covered to this point are superior resource assessment commands. On the other hand, I would guess *ps* is the most often issued system administration command. There are a number of options you can use with *ps*. I normally use *e* and *f*, which provides information about every ("e") running process and lists this information in full ("f"). The example in the box below is a partial *ps -ef* listing.

Here is a brief description of the headings:

most common. As an alternative to sending the signal, you could send the corresponding signal number. Here is a list of signal numbers and corresponding signals:

signal number	signal
0	0
1	SIGHUP
2	SIGINT
3	SIGQUIT
4	SIGALRM

ps -ef

UID	PID	PPID	C	STIME	TTY	TIME	COMMAND
root	0	0	0	Jan 2	?	0:00	swapper
root	1	0	0	Jan 2	?	0:01	/etc/init
root	2	0	0	Jan 2	?	0:01	vhand
root	3	0	0	Jan 2	?	0:02	statdaemon
root	8	0	0	Jan 2	?	0:01	unhashdaemon
root	6	0	0	Jan 2	?	0:02	sockregd
root	11	0	0	Jan 2	?	0:01	syncdaemon
root	45	0	0	Jan 2	?	0:02	syncer
lp	49	0	0	Jan 2	?	0:04	lpsched
root	129	1	0	08:07:33	?	0:00	/etc/cron
oracle	2079	2071	0	07:34:22	?	9:22	oracle
daemon	2088	98	0	08:23:11	ttyp0	8:23	/usr/bin/X11
becker	278	57	0	09:22:45	ttyp2	5:2	ANSYS
lori	234	67	0	08:23:43	ttyp3	6:33	ileaf

UID The user ID of the process owner.
 PID The process ID. (You can use this number to kill the process).
 PPID The process ID of the parent process.
 C Process utilization for scheduling.
 STIME Start time of the process.
 TTY The controlling terminal for the process.
 TIME The cumulative execution time for the process.
 COMMAND The command name and arguments.

5	SIGTERM
6	SIGABRT
9	SIGKILL

To kill the last process shown in this *ps* example, you would issue the following command:

```
$ kill -9 234
```

process id (PID)

signal number

kill command to terminate the process

ps gives a quick profile of the processes running on your system. If you issue the *ps* command and find a process is hung, you can issue the *kill* command. *kill* is a utility that sends a signal to the process you identify. The most common signal to send is "SIGKILL," which terminates the process. There are other signals you can send to the process, but SIGKILL is the

Show Remote Mounts with *showmount*

showmount is used to show all remote systems (clients) that have mounted a local file system. *showmount* is useful for determining the file systems that are most often mounted by clients with NFS. The output of *showmount* is particularly easy to read because it lists the hostname and the directory mounted by the client.

I have found that NFS servers often end up serving many NFS clients that were not originally intended to be served. This consumes additional HP-UX system resources on the NFS server as well as additional network bandwidth. Keep in mind that any data transferred from an NFS server to an NFS client consumes network bandwidth and in some cases this may be a substantial amount of bandwidth if large files or applications are being transferred from the NFS server to the client. The following example is a partial output of *showmount* taken from a system that is used as an example later in this article:

```
# showmount -a
hp100.ct.mp.com:/applic
hp101.ct.mp.com:/applic
hp102.cal.mp.com:/applic
hp107.cal.mp.com:/applic
hp108.cal.mp.com:/applic
hp109.cal.mp.com:/applic
hp100.cal.mp.com:/usr/users
hp101.cal.mp.com:/usr/users
hp106.cal.mp.com:/usr/users
hp107.cal.mp.com:/usr/users
hp108.cal.mp.com:/usr/users
hp109.cal.mp.com:/usr/users
```

The *showmount* command has the three following options:

-a prints output in the format “name:directory” as shown above.

-d lists all of the local directories that have been remotely mounted by clients.

-e prints a list of exported file systems.

Show Swap with *swapinfo*

If your system has insufficient main memory for all of the information it needs to work with, it will move pages of information to your swap area or swap entire processes to your swap area. Pages that were most recently used are kept in main memory while those not recently used will be the first moved out of main memory.

I find that many system administrators spend an inordinate amount of time trying to determine the right amount of swap space for their system. This is not a parameter you want to leave to a rule of thumb. You can get a good estimate of the amount of swap you require by considering the following three factors:

1. How much swap is recommended by the application(s) you run? Use the swap size recommended by your applications. Application vendors tend to be realistic when recommending swap space. There is sometimes competition among application vendors to claim the lowest memory and CPU requirements in order to keep the overall cost of solutions as low as possible, but swap space recommendations are usually realistic.
2. How many applications will you run simultaneously? If you are running several applications, sum the swap space recommended for each application you plan to run simultaneously. If you have a database application that recommends 200 MBytes of swap and development tool that recommends 100 MBytes of swap, then configure your system with 300 MBytes of swap minimum.
3. Will you be using substantial system resources on periphery functionality such as NFS? The nature of NFS is to provide access to file systems, some of which may be very large, so this may have an impact on your swap space requirements.

You can view the amount of swap being consumed on your system with *swapinfo*. The following is an example output of *swapinfo*:

```
# swapinfo
      Kb    Kb    Kb    PCT    START/    Kb
TYPE  AVAIL  USED  FREE   USED  LIMIT  RESERVE PRI  NAME
dev   204505 8401  196104 4%    820534  -      0    /dev/dsk/c201d6s0
hold  0       30724 -30724
```

Here is a brief overview of what *swapinfo* gives you:

The “TYPE” field indicates whether the swap is “dev” for device, “fs” for file system, or “hold,” which means this is not device or file system but is space viewed by the kernel as being available if needed.

“Kb AVAIL” is the total swap space available in 1,024-byte blocks. This includes both used and unused swap. The previous example shows roughly 204 MBytes

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of device swap.

"Kb USED" is the current number of 1,024-byte blocks in use. The previous example shows only about 8.4 MBytes of swap in use.

"Kb FREE" is the difference between "Kb AVAIL" and "Kb USED." In the previous example this is 204 MBytes minus 8 MBytes, or roughly 196 MBytes.

"PCT USED" is the "Kb USED" divided by "Kb AVAIL", or 4 percent in the previous example.

"START/LIMIT" is the block address of the start of the swap area.

"Kb RESERVE" is "-" for device swap or the number of 1,024-byte blocks for filesystem swap.

"PRI" is the priority given to this swap area.

"NAME" is the device name for the swap device.

You can also issue the *swapinfo* command with a series of options. Here are some of the options you can include:

-m to display output of *swapinfo* in MBytes rather than 1024-byte blocks.

-d prints information related to device swap areas only.

-f prints information about filesystem swap areas only.

To be continued in the next issue of *hp-ux/usr*. ■

Marty Poniatowski is a technical consultant with Hewlett-Packard. He is author of The HP-UX System Administrator's "How To" Book, published by Prentice Hall, which can be ordered by calling 1-203-377-4746.

SD for HP-UX 10.0



b y B i l l M u l l a n e y

Part 1 of this article presented an overview of SD-UX as the software management toolset for HP-UX 10.0. In this second part, four “scenarios” of typical system administration tasks provide detailed examples of SD command syntax.

Scenario 1

This scenario shows various uses of *swlist* to browse a server system in search of a particular software object.

Assume you know that a site server system, named *hpuxsrvr*, has a version of a whimsical application named *Foresee* available for installation. The first problem is to find which of several depots on *hpuxsrvr* contains the application product. That takes two steps, the first to list all depots served on *hpuxsrvr* and the next to browse the most likely depot.

The command to list all depots registered on the system is:

```
swlist -l depot @ hpuxsrvr
```

The output returned is:

```
# Initializing...
# Target "hpuxsrvr" has the following depot(s):
  /release/hpux/10.00/s800
  /release/hpux/10.00/s700
  /release/hpux/10.01/s800
  /release/hpux/10.01/s700
  /release/SD/10.00
  /test/applications/10.00
  /test/applications/10.01
  /var/spool/sw
```

Selecting the depot named */test/applications/10.00* as the most likely place to find an application for the 10.0 release, you then have to list the products in that depot. You use the command:

```
swlist -d -l product @ hpuxsrvr:/test/applications/10.00
```

The output is:

```
# Initializing...
# Contacting target "hpuxsrvr"...
#
# Target:  hpuxsrvr:/test/applications/10.00
#
C-ANSI-C      B.10.00.00  HP C/ANSI C Compiler
C-Plus-Plus   B.10.00.00  HP C++
FORTRAN       B.10.00.00  FORTRAN Programming
Foresee       B.10.00.00  Paranormal Failure Detection
HPPAK         B.10.00.00  HP Programmer's Analysis Kit
Pascal        B.10.00.00  Pascal Programming
ProgSupport   B.10.00.00  ProgSupport
```

Checking the files that are delivered in the *Foresee* product is done with the command:

```
swlist -dl file Foresee @ hpuxsrvr:/test/applications/10.00
```

The output is:

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```
# Initializing...
# Contacting target "hpuxsrvr"...
#
# Target:  hpuxsrvr:/test/applications/10.00
#
#  Foresee          B.10.00.00      Paranormal Failure Detection
#  Foresee.FORESEE-RUN  B.10.00.00      ESP Daemon
#
# /
# /opt
# /opt/foresee
# /opt/foresee/bin
# /opt/foresee/bin/espd
# /opt/foresee/bin/foresee
# /opt/foresee/include
# /opt/foresee/include/foresee.h
# /opt/foresee/include/predict.h
# /opt/foresee/lib
# /opt/foresee/lib/errs
# /opt/foresee/lib/nls
# /opt/foresee/lib/nls/msg
# /opt/foresee/lib/nls/msg/C
# /opt/foresee/lib/nls/msg/C/esp_msgs.cat
# /opt/foresee/newconfig
# /opt/foresee/newconfig/RelNotes
# /opt/foresee/newconfig/RelNotes/foresee.10.0
# /opt/foresee/share
# /opt/foresee/share/man
# /opt/foresee/share/man/man1.Z
# /opt/foresee/share/man/man1.Z/foresee.1
# /opt/foresee/share/man/man1.Z/espd.1
```

Scenario 2

This scenario shows a typical installation sequence. It uses command-line mode to show the command's syntax, but GUI mode can be used as well. Adding the "-i" option to any of the *swinstall* commands shown here invokes the command in interactive mode.

The user can preview the effects of installing the product by giving the "-p" option to the *swinstall* command:

```
swinstall -p -s hpuxsrvr:/test/applications/10.00 Foresee
```

The command output is:


```

===== 06/01/95 12:00:21 MDT BEGIN swinstall SESSION
(non-interactive)

* Session started for user "root@hpwkstn".

* Beginning Selection Phase.
* Options:
    preview no yes
    target type root root
    linkinstall no no
    verbose 0 1
    option file
    session file
    software file
    target file

* Target connection succeeded for "hpwkstn:/".
* Source connection succeeded for
  "hpuxsrvr:/test/applications/10.00".
* Source: hpuxsrvr:/test/applications/10.00 hpuxsrvr:/test/applications/10.00
* Targets: hpwkstn:/ hpwkstn:/
* Software selections:
    Foresee.FORESEE-RUN,r=B.10.00.00,a=HP-UX_B.10.00_700/800,v=HP
* A "+" indicates an automatic selection due to dependency or
  the automatic selection of a reference bundle.
* Selection Phase succeeded.

* Beginning Analysis Phase.
* Session selections have been saved in the file
  "/home/root/.sw/sessions/swinstall.last".
* The analysis phase succeeded for "hpwkstn:/".
* Analysis Phase succeeded.

NOTE: More information may be found in the agent logfile (location
      is hpwkstn:/var/adm/sw/swagent.log).
===== 06/01/95 12:00:32 MDT END swinstall SESSION (non-interactive)

```

The output that would appear in the *swagent.log* file is:

hp-ux/usr

Workstation Articles

Interex initiated the publication of *hp-ux/usr* to serve the needs of HP-UX users. It is a forum for sharing information on all HP-UX systems—including workstations, business systems, and networks. The award-winning magazine is now in its third year of publication, and it has met with an enthusiastic response from its readership.

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```

=== 06/01/95 12:00:22 MDT BEGIN install AGENT SESSION (pid=17661)
* Agent session started for user "root@hpwkstn.fc.hp.com".
  (pid=17661)

* Beginning Analysis Phase.
* Source: hpuxsrvr:/test/applications/10.00
* Target: hpwkstn:/
* Target logfile: hpwkstn:/var/adm/sw/swagent.log
* Options:
  loglevel 1
  create_target_path true
  use_alternate_source false
  mount_all_filesystems true
  autoreboot false
  enforce_dsa true
  install_setup_cmd /usr/lbin/sw/install_setup
  system_prep_cmd /usr/lbin/sysadm/system_prep
  system_file_path /stand/system
  kernel_build_cmd /usr/sbin/mk_kernel
  kernel_path /stand/vmunix
  install_cleanup_cmd /usr/lbin/sw/install_clean
  uncompress_cmd /usr/contrib/bin/gunzip

  autorecover_product false
  reinstall false
  allow_downdate false
  allow_multiple_versions false
  allow_incompatible false
  enforce_dependencies true
  enforce_scripts true
  enforce_kernbld_failure true
  defer_configure false

  reinstall_files true
  reinstall_files_use_cksum true
  write_remote_files false
  compress_files false
* Reading source for product information.
* Reading source for file information.
* Checking mounted filesystems.
* Checking existing products and filesets.
* Running any "checkinstall" scripts.
* Checking product and fileset dependencies.
* Checking disk space requirements.
NOTE: The used disk space on filesystem "/" is estimated to increase by 2 Kbytes.
      This will leave 28635 Kbytes of available user disk space after the installation.
NOTE: The used disk space on filesystem "/opt" is estimated to increase by 148 Kbytes.
      This will leave 103863 Kbytes of available user disk space after the installation.
* Summary of Analysis Phase:
  New Install Foresee.FORESEE-RUN,r=B.10.00
* The Analysis Phase succeeded.

* Removing product information used for analysis.

===== 06/01/95 12:00:32 MDT END install AGENT SESSION (Canceled)
  (pid=17661)

```


The next step is to proceed with the actual software installation using the same command as before, except this time omitting the “-p” option.

```
swinstall -s hpuxsrvr:/test/applications/10.00 Foresee
```

Next the installed state and revision of the installed software can be listed with the command:

```
swlist -l fileset -a state -a revision Foresee
```

which gives output like:

```
# Initializing...
# Contacting target "hpwkstn"...
#
# Target: hpwkstn:/
#
Foresee.FORESEE-RUN    configured
```

Or the files in the Foresee product can be listed with the command:

```
swlist -l file Foresee
```

The final step is to verify the software with the command:

```
swverify Foresee
```

Scenario 3

Removing a product or a fileset from the system is relatively simple:

```
swremove Foresee
```

However, you may want to install a more recent revision of an application, yet keep the current revision of that application on the system. Assuming that the application is relocatable, the following sequence will accomplish that.

First you must unconfigure the application:

```
swconfig -u Foresee,r=B.10.00,a=HP-UX_B.10.00_700/800,v=HP
```

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ad•vo•cate: to plead in favor of, *see support*

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Then you install the new revision to a location other than the default:

```
swinstall -s hpuxsrvr:/test/applications/10.01 Foresee:/opt/app_4.0
```

In this way you can have multiple revisions of an application present on the system, yet have only one configured at a time. To select among the installed revisions, you can unconfigure the currently configured application, then configure the one you want:

```
swconfig -u Foresee,r=B.10.00.04,a=HP-UX_B.10.00_700/800,v=HP
swconfig Foresee,r=B.10.00.03,a=HP-UX_B.10.00_700/800,v=HP
```

Scenario 4

This scenario shows how a developer can use *SD* to package software and create a depot to distribute it.

The first task is to create a PSF file: a plain text ASCII file with a prescribed format that describes the software in terms of products, subproducts, and filesets. A trivial PSF file would look like:

```
# This is a demo PSF file.

product
  tag          Demo
  revision     B.10.00
  title        PSF Demonstration Product
  description   Product containing an empty fileset
  directory    /
  architecture HP-UX_B.10.00_700/800
  machine_type 9000/*
  is_locatable true
  os_name       HP-UX
  os_release    ?.1?.0*
  os_version    ?
  share_link    usr

  fileset
    tag          VOID
    revision     B.10.00
    title        Fileset containing absolutely nothing
    configure    /home/robin/media/demo/catalog/configure
    directory    /home/robin/media/demo/root=/
    file *
  end
end
```


Then, a prudent developer would preview the packager action by using the “-p” option to the swpackage command:

```
swpackage -pv -s $HOME/media/demo/PSF @ /depots/media/demo
```

When the results of the preview are acceptable, omitting the “-p” option will result in creating the depot and registering it.

```
swpackage -v -s $HOME/media/demo/PSF @ /depots/media/demo
```

The existence of the new depot can be verified:

```
swlist -l depot
```

The contents of the depot can then be listed:

```
swlist -dl product @ /depots/media/demo
```

The depot can be copied to another system by that system’s administrator using the *swcopy* command from that system:

```
swcopy -s hpswdev:/depots/test/demo @ hpuxsvr:/depots/pub/demo
```



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Interex on Internet

Interex has established connections to Internet, allowing for fast and easy e-mail exchange between Interex and its members. To send e-mail to Interex, use the following address format:

<IDname>@interex.org
example = wright@interex.org

The following IDs are currently active on INTEREX’s HP 9000:

ID	Department
postmaster	InterNet support
cslhpux	CSL/HP-UX
cslmpe	CSL/MPE
membership	Membership Services
pubs	Publications
conference	Conference information

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A User's Guide to

RTE-A6.2

by Colleen Dillon



Release 6.2 of RTE-A features improved installation procedures, a file system server as part of the NS-ARPA/1000 and ARPA/1000 products allowing NFS connectivity, file system support of byte stream files, and new commands. This article is a high-level user's introduction to these improvements.

***RTE_INSTALL.CMD* Installation**

The new *RTE_INSTALL.CMD* command file simplifies installation by allowing you to install RTE-A, VC+, and other selected subsystems from one command file. The installation files for several products now use consistent variable names to facilitate the installation of multiple products via *RTE_INSTALL.CMD*.

The *RTE_INSTALL.CMD* file enables you to customize your installation requirements. You can specify which products to install and the target directory names, and also set the installation variables for the various products. We recommend that you create your own customized command file to set all the necessary variables for your environment before transferring to *RTE_INSTALL.CMD*.

The default installation variables that the *RTE_INSTALL.CMD* file uses are based on the premise that you will be building a system for another target system (not the local host). Therefore the defaults were chosen so as not to disrupt the local host system activity (for example, *MAIL*, and *LP*). In view of this, the *RTE_INSTALL.CMD* defaults for subsystem variables may differ from those in the individual subsystem installation files. *RTE_INSTALL.CMD* will override the defaults in the individual subsystem installation files.

The *RTE_INSTALL.CMD* file can be used to link RTE-A and a number of other RTE-A subsystems and products. When used with a CDS version of CI, *RTE_INSTALL.CMD* can be used to install the current revisions of the following products and subsystems: RTE-A, VC+, NS-ARPA/1000, ARPA/1000, LP, Mail/1000, LANVCP, FTN7X, Pascal/1000, HP C/1000, Debug/1000, XDB, IMAGE/1000-II, and FORMS/1000.

File Server Capability

The HP 1000 File Server for NS-ARPA/1000 and ARPA/1000 allows files that reside on the HP 1000 to be shared in a networked system environment of dissimilar operating systems. More specifically, files may be shared with a client system, for example an HP 9000, that has the NFS (Network File System) client capability installed.

From an NFS client node you can access files located on the HP 1000 file server as if they were local files, thus eliminating unnecessary remote file transfers to the local client node. If you are an RTE-A program developer, you can also benefit by having access to program development tools such as *vi* and *emacs*.

The HP 1000 file server program called *FSRV* reads the */etc/exports* file on the HP 1000 to determine which RTE-A directories to make accessible to a particular client.

For an NFS client needing to *mount* or *umount* RTE-A directories, the user interface is the same as for any other file system *mount* or *umount* on an NFS client.

The use of a mounted RTE-A file system is not completely transparent, however, when you access it from an NFS client. Many aspects of the RTE-A file system are different from the typical UNIX file system (for example, RTE is case insensitive). These differences result in some restrictions on the use of the RTE-A file system when accessed by an NFS client, especially in the area of file names and file types.

Type 12 File Support

In support of the file server capability of NS-ARPA/1000 and ARPA/1000, a new file type was added to RTE-A as of 6.2. A type 12 file now specifies a byte stream file. Any RTE-A file that is created by an NFS client, other than a directory or a symbolic link, is created as a type 12 byte stream file.

Translation to Type 12 Format

All files other than type 4 are transferred in binary mode when accessed from an NFS client. Type 4 files will always be translated to type 12 format. Optionally, you can specify other RTE variable record length ASCII file types that should be translated to byte streams for file reads requested from a client.

When reading RTE variable record length ASCII files in ASCII mode, the HP 1000 file server strips out the preamble and postamble and inserts a line feed after every record. This enables

RTE ASCII files to look like UNIX ASCII files to the client. So for your client applications expecting an ASCII file, an RTE ASCII file looks like a byte stream file.

The HP 1000 file server does not support the writing of variable record length ASCII files, but you are able to edit them from a client because of the way *vi* and *emacs* operate. These utilities read the entire file and then create new files when replacing files. The existing files are either renamed or removed. This causes variable length files to be converted to type 12 files if they are edited from a client.

Cautionary Note

You should take care that your boot command file does not get converted to a type 12 file by editing it from an NFS client. BOOTEX cannot read type 12 files!

FMP Code Growth Considerations

The new \$UFMP library includes support of FMP with symbolic links and type 12 files. You will need to choose this library during the installation process if you plan to use the HP 1000 file server functionality.

Due to the code growth of the \$UFMP library versus the \$FMP library, some non-CDS applications will need modifications before they can be relinked. The level of modifications and effort depend upon the application.

For programs performing only reads and writes, the code growth is around 800 words. For programs that need to read, write, and position files the code growth is approximately 1000 words. For most CDS applications, this is not a problem. This may be a problem for non-CDS applications. Only CDS versions of HP-supplied utilities on RTE-A are supported with type 12 files.

Effect on Existing RTE-A Applications

The HP 1000 file server does not impose any restrictions on the NFS client when reading an existing RTE-A file. So if your applications only collect data for export to a client, you do not need to modify them. However, if FMP code growth is a problem, you may need to relink with the \$FMP or \$SFMP library. These libraries are now copied to the */LIBRARIES* directory during installation.

Applications that read and write files that are written from an NFS client need to be relinked with the \$UFMP library. Applications that make calls to FmpPosition or FmpSetPosition and need to position type 12 files must be converted for type 12 file support using the new FMP positioning calls (FmpFpos and FmpSetFpos). If your application reads files written from an NFS client only on a very limited basis, you can consider converting the files on the RTE-A system to type 4 files before the application accesses them. This is a last resort solution for any non-CDS application that requires access to data generated by an NFS client.

New Commands

With the addition of *cron*, *crontab*, and *ktest*, RTE provides more HP-UX system-like commands in the area of time scheduling and conditional evaluation.

cron and *crontab*

Similar to the HP-UX *cron* command, *cron* on RTE-A runs programs at defined dates and times according to entries specified in *crontab* files. *cron* should be executed only once and is typically run from the system welcome file ("*xq cron*"). You can specify *crontab* files via the *crontab* command. *cron* examines *crontab* files upon start-up and when a file changes due to a *crontab* command. As on HP-UX, access to the *crontab* command is controlled by the */usr/lib/cron/cron_allow* and */usr/lib/cron/cron_deny* files.

ktest

The new *ktest* command provides ksh-style conditional evaluations from CI command files. It can test for various file attributes and time stamps, and also provides pattern matching.

Usage:

```
ktest expr
```

where several allowable primitives are available to construct *expr*. For example, the following construct prints a file if it begins with 'a', 'b', or 'c', the file is neither a directory nor a type 6 (executable) file, and the user has read access to the file:

```
if ktest $file = [abc]@ && ! ( -d $file || -x $file ) && -r $file
then
    lp $file
fi
```

Conclusion

Release 6.2 contains significant improvements for users. Early feedback indicates positive benefits from the streamlined installation process, the ability to mount RTE volumes in a heterogeneous networked environment, and the addition of more HP-UX system-like commands. Users who operate in a mixed RTE-A/HP-UX environment will appreciate the expanded interoperability and commonality offered in this release. If you have not already updated to 6.2, we encourage you to do so to take advantage of this latest offering. ■

Colleen Dillon has been with HP for ten years, seven of which she has spent working on the HP 1000 or networking products. She joined the RTE group in 1992 first as a Technical Writer and later as a Technical Marketing Engineer. She was responsible for the Communicator/1000 for Release 6.2.

UUCP Polling

THIS MONTH I START BY looking at setting up UUCP to automatically poll a remote site; then I describe an interesting utility program I found and finally talk about using the World Wide Web as a resource for System Administration.

The first column I wrote for Interex was about setting up a UUCP system. This was published in *Interact* back in late 1991. The article was based on HP-UX 7.0 and had some serious hacks for getting UUCP installed and for polling remote sites. Now, with HP-UX 9.0x and later, HP has significantly updated its documentation and support utilities for UUCP.

At the end of this past summer I finally upgraded my e-mail/news server to HP-UX 9.04. It had been on 8.0 for several years to support our customers who were still running that release. One week to the day after our last customer upgraded to 9.04, I updated our server. (Can you guess that I was a little excited that we did not have to support HP-UX 8.0 anymore?)

One of the first things I noticed when setting up my UUCP system again was that there were several new files in `/usr/lib/uucp` that were not on my 8.0 system (which was upgraded from 7.0). I completely installed 9.04 instead of upgrading. Several of these files began with *uudemon*.

The first was *uudemon.admin*. This script file is called to check the status of the UUCP system and mail the results, if any problems are detected, to the *uucp* user. The script executes `uustat -p` (check for executing UUCP processes) and `uustat -q` (list the status of all UUCP connections that are not 'SUCCESSFUL'). If either command returns data, this information is mailed to the *uucp* user. This script is usually run two or three times a day.

The second is *uudemon.cleau* (I guess they forgot the *p*?). This script trims the *uucp* log files. If you remember, in my last column I presented a scheme for purging these log files. Well this is a nicer, supported method.

The script copies the old log files to the `/usr/spool/uucp/.Admin` directory, then cleans up the site-specific log files. This is important because UUCP records each buffer sent between two systems. These files tend to grow very fast. The script then looks for core files in the `/usr/spool/uucp` and `/usr/spool/uucppublic` directories and mails any error logs and a list of core files to the *uucp* login.

One thing that the *uudemon.cleau* script does, which I do not like and commented out, is remove the *uucp* and *nuucp* mailboxes when it is run. To me this is silly. Earlier in the script it sends e-mail to these logins, then goes and removes the mailboxes. Also, on my system, the *uucp* and *nuucp* mailboxes are forwarded to root (which are then forwarded to me) so I only have to read one mailbox each day and I receive notifications of problems immediately. To prevent this, comment out the last line in the file:

```
#rm -f $MAILDIR/uucp $MAILDIR/nuucp $TMP
```

and add the following to remove the temporary error log:

```
rm -f $TMP
```

The next two scripts work together: *uudemon.hour* and *uudemon.poll*. The

uudemon.poll script looks at the */usr/lib/uucp/Poll* file and determines which systems need to be polled via *uucp*. The Poll file has a very easy syntax:

<name> <tab> <hours>

where <name> is the name of the UUCP site, from the Systems file, that you want to poll, <tab> is the tab character and must be present, and <hours> is a list of hours, 0 - 23, space separated, when the site can be polled.

For example an entry of:

```
wittsend    0 1 2 3 4 5 6 7 8 12 17 18 19 20 21 22 23
```

indicates that the UUCP site wittsend can be polled from midnight to 8 a.m., at 12 p.m., and from 5 p.m. until 11 p.m.

The *uudemon.poll* script looks at each site name in the Poll file and determines if the site can be polled at the current hour. The *uudemon.poll* script is called once an hour. If the site can be polled, the script creates a *C.xxxxx* file in the site's UUCP directory. The existence of this file causes the UUCP system to try to call the remote site. (The *xxxxx* is replaced with a sequence number, so multiple calls to *uudemon.poll* result only in the creation of one file, but the timestamp is updated each time. Also after every successful connection to the remote site, the sequence number is updated.)

The *uudemon.hour* script is designed to be called once an hour. It looks at all the UUCP sites configured to see if there are any outbound UUCP requests or the *C.xxxxx* file indicating that it is time to poll the site. Even if you are not using the Poll and *uudemon.poll* scripts, the *uudemon.hour* script will retry UUCP requests that did not succeed.

All of these scripts should be executed by *cron* as the *uucp* user. The *crontab* for *uucp* on my server is:

```
39,9 * * * * /usr/lib/uucp/uudemon.hour > /dev/null
5 * * * * /usr/lib/uucp/uudemon.poll > /dev/null
45 23 * * * ulimit 5000; /usr/lib/uucp/uudemon.cleau >
/dev/null
48 10,14 * * 1-5 /usr/lib/uucp/uudemon.admin > /dev/null
```

As you can see, the *uudemon.poll* script is called at 5 minutes past each hour and the *uudemon.hour* script is called twice: at 9 minutes and 39 minutes past each hour. The *uudemon.poll* script must be called before the *uudemon.hour* script, otherwise the *uudemon.hour* script's programs will not find the poll request until the following hour. We call the *uudemon.hour* script twice an hour so we have 20 minutes between each poll.

The *ulimit* command before the execution of *uudemon.cleau* is used to restrict the size of the files that *uudemon.cleau* can create. In this case the maximum size is 5,000 bytes. This is used because if *uudemon.cleau* detects a large number of problems, it will create and mail a huge file, when all the system administrator needs is a notification that something is wrong.

The script files that send e-mail automatically send it to the *uucp* login. If you

want to change the destination, you can either set up the *uucp* login to forward the mail or edit the scripts and change the MAILTO variable. I recommend setting up a forward script for *uucp*. To do this, read and delete all the mail for *uucp*. As root edit the */usr/mail/uucp* file and add the following:

Forward to root

Or change the destination name to be someone other than root. You can also forward it to someone on another system, such as 'Forward to chris@bwilab3'.

One last note about polling remote sites: The Poll file defines only when the site should be polled. If your *uucp* configuration for the site does not allow calling during the times the Poll file says to poll, the site will not be contacted. Likewise the fact that the Poll file does not have a poll request for a specific hour does not mean that the *uudemon.hour* will not try to connect to the remote site. Look at the setup of the remote site in the */usr/lib/uucp/Systems* file to define when the remote site can be called.

/etc/sysdef Program

Have you ever wanted to see the configuration of your kernel without running *sam*? Well I always thought it could not be done, until I found the */etc/sysdef* program. This program, which is available only on the 800 and 'letter' series servers, lists the following information about the kernel:

Tunable parameter information:

- Message Related Parameters
- Semaphore Related Parameters
- Shared Memory Related Parameters
- Accounting Code Parameters
- File System Parameters

Process Related Parameters
Miscellaneous Parameters
Networking Parameters
Cluster Related Parameters
Swap Related Parameters
Device (Swap/Root/Dump)
Information
Memory statistics

This, when combined with the output of `/etc/swapinfo`, provides a very detailed description of your configuration (minus networking information). I found it as part of the SOE fileset on my 9.04 systems. There is also a man page for it! (Unfortunately I could not find an equivalent for 700s or for other 9.0x releases.)

I have started to print out the results of this command, along with `/etc/swapinfo`, a listing of `/etc/checklist`, `/etc/inittab`, and `/etc/passwd` once a month. This gives me a baseline of what to work towards if I ever have to rebuild the system without having backup tapes. (I started doing this after having to rebuild a system at 3 a.m. when all the backups except for the most recent incremental were in a bank safe deposit box!)

/etc/newconfig/backup Script

One of the most asked questions I receive from new systems administrators, is for a backup script. I used to give them a copy of my script and walk them through editing it to match their system. Then I was looking in `/etc/newconfig` and saw the backup script. This script does not use `fsbackup` to perform the backups and can perform incremental backups as well. It also has a nice option to perform an `fsck` on the disks when the backups are done.

Take a look at it if you are looking for a starting point for backing up your system.

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World Wide Web Sites

In a new "section" of this column I will try each issue to suggest a new Web site for system administration. Naturally you should be checking out the Interex Web site at <http://www.interex.org> and checking out my back columns.

This month's site is for comp.sys.hp.hpux FAQ (Frequently Asked Questions.) This site is updated each time the FAQ is changed. The FAQ addresses a large number of topics frequently encountered in the comp.sys.hp.hpux newsgroup. The site is: <http://hpux.csc.liv.ac.uk/FAQ>.

Another site is the HP SupportLine at <http://support.mayfield.hp.com>. I'll be checking this one out and will have a full report on what is available next time.

One general suggestion about browsing the Web. A friend of mine told me that he has created bookmarks to this column on the Interex Web server so he can access a specific column when

he needs it. He is using the Netscape browser, but my Spry Mosaic browser has a similar feature called Personal Favorites. This is an interesting idea—your own list of HP-UX tips and solutions, indexed how you want and accessible when you need them!

Well, that's it for this time. Please keep the e-mail coming and if you have any suggestions for future columns or Web sites that I should check out and that might be of interest to the readers, please send them to me. ■

Chris Curtin, a software developer for Bradley Ward Systems, Inc. in Atlanta, Georgia, specializes in device driver development for factory automation on the HP 9000. He can be reached via e-mail at: chris@bwilab3.atl.ga.us.

Thrifty Shell Scripts

IN THIS DAY AND AGE of T500s and K class machines, the idea of taking the time to make a shell script more efficient would almost appear to be a waste of time. But, if you think about how to make them more efficient while you write them, you can make your shell scripts enduring and less likely to cause you trouble in the future. The concepts are few and basic:

1. Be conscious of PATH
2. Wisely use directory references
3. Use built-in statements where possible
4. Use pipelines (efficiently)

None of these alone will help a shell perceptibly. But, together, in a large, complex shell, they just might make it work noticeably faster. Also, you should consider the aggregate effect of many small but inefficient shell scripts all running at once or over time.

As you write shell scripts, remember that they inherit the PATH variable of the calling shell. Therefore, you might get more than you want or a badly organized PATH. The person using your script might have a long path that specifies a list of directories elsewhere on the system before it specifies the directories your shell script will be using. Your shell will be forced to search through his directories before it finds what you need. All of that searching takes up system resources. You can change the value of PATH within the shell to make directory searches more efficient. As you cut down the PATH searched, make sure you give your shell everything it needs, though. As you formulate a PATH for your shell, keep these ideas in mind:

Most commands are not in the current directory, so, if you use it (I recommend *not* using it), search it last.

Put directories with more frequently used commands first (e.g., */bin* and */usr/bin*).

Do not reset the PATH if you will be depending on information in the user's environment (e.g., a specific version of software on the system the location of which may be specified in their PATH). If you find yourself in this situation, think about using the built-in command *hash* to bypass the PATH search.

Another consideration when working with files is the overhead to traverse full path names. If your script will be referencing several files in a deep directory, consider changing to that directory before manipulating the files. Here are two code segments that accomplish the same task:

```
for FILE in ${WORK_DIR} /*          cd ${WORK_DIR}
do                                  for FILE in *
    cat ${FILE}                      do
done                                  cat ${FILE}
                                   done
```

In terms of the overhead to reference each file in *\${WORK_DIR}*, the segment on the right is more efficient. You merely need to manage the location of the shell script in the file tree.

You also have the option of skipping the PATH search process completely. Many commands are built-in (the shell itself executes them).

Built-in commands also are not subject to memory allocation, process creation, and

other resources required to load and run. Here is a partial list of the built-in commands:

```
cd      echo  eval exec  getopts
read    set   shift     test type
unset   wait  case
```

You might want to use the built-in command `read` rather than `line(1)`. You might also be able to use a `case` statement instead of a `grep(1)`. Here is a comparison:

```
read ANSR          read ANSR
case ${ANSR} in    if echo ${ANSR} | egrep -i "n|no" > \
  [Nn]|[Nn][Oo])                                     /dev/null
    exit 1        then
    ;;            exit 1
esac              fi
```

Besides being more efficient, the code on the left is more flexible in what it matches and the action it takes on various matches. What you give up is that `case` is limited to the Pattern Matching Notation as described in *regex(5)* (the syntax used for file name generation) rather than the more fully featured Regular Expressions that `grep(1)` and `egrep(1)` recognize.

Now that your shell is efficiently finding the commands and data it will be using, take a moment to contemplate what it is doing and how it is accomplishing those tasks. It is very tempting to create temporary files when writing shell scripts. Aside from having to remember to clean them up, writing and then reading a temporary file takes time. Where possible, pass the output of one command to another with a pipeline.

When you build pipelines, think about the amount of work each command must do and how much data you pass to it. Which of the following pipelines that display all login ids belonging to the group `$(THISGROUP)` is more efficient:

```
sort /etc/passwd | grep ":${THISGROUP}:" | cut -d: -f1
grep ":${THISGROUP}:" /etc/passwd | sort | cut -d: -f1
grep ":${THISGROUP}:" /etc/passwd | cut -d: -f1 | sort
```

In the examples, the `sort` command has to work on decreasing amounts of data as you go down the list. Each filter in the pipeline should reduce the amount of data sent to the next filter in the pipeline (when possible).

Creating more efficient shell scripts may not be at the top of your priorities, but integrating these concepts as you design new scripts will not get you fired, either. Besides, setting the `PATH` in a script might alleviate having to debug it for several hours because it fails for a specific user and works fine for everyone else. Or, using a pipeline means one less pesky temporary file for your disk pig detection routines to deal with. ■

After serving several different organizations over the past seven years as a system administrator with various flavors of UNIX, David L. Totsch still enjoys the profession. He also enjoys discussing UNIX with just about anyone. At present, he is working with HP-UX systems and wide-area networks for a Fortune 100 company in the Piedmont area of North Carolina. He can be reached via Internet: dtotsch@wfu.edu.

Join SIGUNIX via e-mail!

HP-UX server and workstation users can now join SIGUNIX, the Interex Special Interest Group (SIG) for UNIX users via e-mail.

Once on the list, you'll be included in SIGUNIX communications and you'll be able to send messages to other SIGUNIX members using the `sigunix@interex.org` address.

To subscribe, send a message to `listman@interex.org`. The message should state: "sub sigunix
firstname lastname."

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HP 1000 Guru

Q: Whenever I update my system and rename directories, such as */libraries*, I seem to run into problems. If I log out and log in, things work the way they should. It seems I cannot just rename my directories without logging off and on. What gives?

A: If you have a given PATH set, and the directory pointed to by that PATH is renamed, either with *RN* or *MV*, then the PATH information is *also* changed.

For example:

```
CI> path 1
UDSP #1: /WALT/ [current WD]
        /PROGRAMS/

CI> rn /programs /targetprograms

CI> path 1
UDSP #1: /WALT/ [current WD]
        /TARGETPROGRAMS/
```

One can see that PATH 1 followed the name change. This can be convenient in this example, since now */TARGETPROGRAMS* contains the former */PROGRAMS* and your PATH 1 will find them.

A problem can occur, however, if you are using PATH 3 for your libraries. For example:

```
CI> path 3
UDSP #3: /LIBRARIES/

CI> rn /libraries /old_libraries
Renaming /LIBRARIES to /OLD_LIBRARIES.DIR ... [ok]

CI> path 3
UDSP #3: /OLD_LIBRARIES/
```

If your system answer file specifies the following for libraries:

```
li,#3/<library>
li,#3/<library>
..etc.
```

you are relying on PATH 3 referring to */LIBRARIES*, which it doesn't anymore. This can cause confusion. If you log off, and log on again, now PATH 3 will point to */LIBRARIES* again since it is set each time you log on.

I am not aware of any other system that dynamically changes PATH settings. There is also one slight inconsistency in RTE concerning the working directory:

```
CI> wd
```

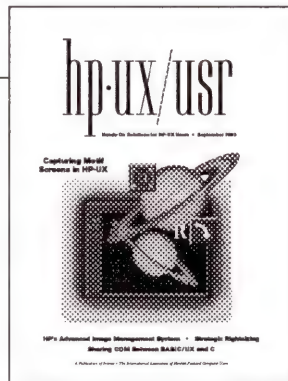

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```

Working directory is /WALT
CI> pwd
/walt
CI> mv /walt /walts
CI> wd
Working directory is /WALTS
CI> pwd
/walt

```

PWD still shows the original working directory, where wd shows the new name.

Q: I always struggle when trying to transfer relocatable files to my 1000 using a 9000 machine as a go-between. Even when the two machines are connected together, I always seem to run into problems with file types and timestamps. What is the best way to transport RTE files via a 9000?

A: The best way to transfer these files is via an FST disk archive. This will maintain the file type information, so that when the files are restored to an HP 1000, they will be in the correct format and also will have the original file timestamp information. This can be used later to verify what you have installed.

To create the desired FST archive follow these steps:

1. Set your working directory to the desired location:

```
CI> wd /<dir>/<dir>...etc
```

2. Run FST to create an ARCHIVE file of the desired files:

```

CI> FST
FST> mt /scratch/archive
FST> ba @
20 files selected
FST> go
FST> ex

```

All of the desired files are now in one archive file.

It can be copied to tape in tar format and restored to an HP 9000. Or the file can be FTP'ed to the desired location.

When the file is restored onto the HP 1000, it is still an archive file. To restore it to original individual files, use FST:

```

CI> fst
FST> mt 24
FST> re @ /scratch/archive
FST> go
FST> un
FST> mt /scratch/archive
FST> re @ /<directory>/@
FST> go
FST> ex

```

This will restore the files, maintaining all the file attributes. This is the best way to move files between systems.

Q: I have updated from DS/1000-IV to NS/1000, using DS/1000-compatible services. I have a program that accesses the NRV table in the operating system, but now that program no longer works. How can I access the NRV table when running NS/1000?

A: In NS/1000, the larger DS tables were moved from SMB (System Memory Block) to DSAM. SMB is the memory in the system map that is specified by the MB command when the system is generated. DSAM is the shared memory area used by NS. It is allocated as a SHEMA by the MMINIT program with the name #DSAM. During initialization, the name is changed to „,DS. After initialization DSAM is accessed through map set 6 using cross map instructions.

To access DSAM, a program must be in privileged mode and have map set 6 in its working map.

This is done by the routine DS_EnterCritical. In addition to setting the data2 map to 6, DS_EnterCritical uses a dispatch lock or a resource number lock to synchronize access to DSAM by the NS programs. When a program is finished with DSAM, it must call DS_LeaveCritical to restore its original working map and release the lock.

In most cases the dispatch lock is used. The resource number is used only when a critical program has a CDS segment fault or it is being run with symbolic debug and it is stopped in

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a critical region. In the latter case, debug will report an SR violation, but you can continue to debug the program. Programmers should read Chapter 12 of the *RTE-A Programmer's Reference Manual* to understand the consequences of privileged mode and dispatch lock.

The time a program spends between calling `DS_EnterCritical` and `DS_LeaveCritical` should be minimized. Because FORTRAN uses the data2 map to access constant strings in code space, one must use the `$CLIMIT 32767` directive or be sure that constant strings in code space are not accessed between calling `DS_EnterCritical` and `DS_LeaveCritical`.

Here are the calling sequences for `DS_EnterCritical` and `DS_LeaveCritical`:

```
call DS_EnterCritical(wkmap, error)
```

wkmap—integer*2—output

Returns the program's working map register.

error—integer*2—output

Returns a non-zero value if the call fails.

Error codes can be found in the *NS-ARPA/1000 Error Messages and Recovery Manual*, pages 6-18, Memory Manager Log Message Codes.

```
call DS_LeaveCritical(wkmap)
```

wkmap—integer*2—input

The working map register value returned by `DS_EnterCritical`.

NRV Table

NS NRV TABLE FORMAT:

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
DS Node Number															
Timeout								Reserved				Format Levl			
C	Reserved					T	N	Communication Link LU							
IP Address word one															
IP Address word two															

For NS, the T bit and the IP address have been added to each NRV entry. The T bit is 1 if the link is non-router (non-DS), i.e., LAN.

#NRVS—This routine is available in both DS and NS. Given a DS node number (router address in NS terminology) or a negative link LU, it will return most of the information from the NRV entry.

Macro calling sequence:

```
JSB #NRVS
DEF RETRN
DEF NODE
[ DEF TIMOT ]
```

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```
[ DEF LEVEL ]
[ DEF NAYBR ]
[ DEF NNODE ]
[ DEF LINKT ] ; For NS only
RETRN <error return> ; returns here if node not found B="07"
      <normal return> ; A = LU, B = index in table
```

FORTTRAN calling sequence:

```
$alias nrv_search='#NRVS', noabort
call nrv_search(node[,timot[,level[,naybr[,nnode[,linkt]]]]],*99)
call abreg(lu, index) ! normal return
```

```
99 continue ! error return
```

node—integer*2—input
DS node number or negative lu to search for.

timot—integer*2—output—optional
Master timeout.

naybr—integer*2—output—optional
Non-zero if node is a neighbor to local node (N bit).

nnode—integer*2—output—optional
Returned node number. Used when a negative LU is input.

linkt—integer*2—output—optional—NS only
Non-zero if non-DS link (T bit).

lu—integer*2—output—returned in A register
Link lu.

index—integer*2—output—returned in B register
Index of entry in NRV table.

With the exception of the LINKT parameter #NRVS works the same on both NS and DS systems. The NS version calls DS_EnterCritical and DS_LeaveCritical, so the program must not be 'critical' when calling #NRVS.

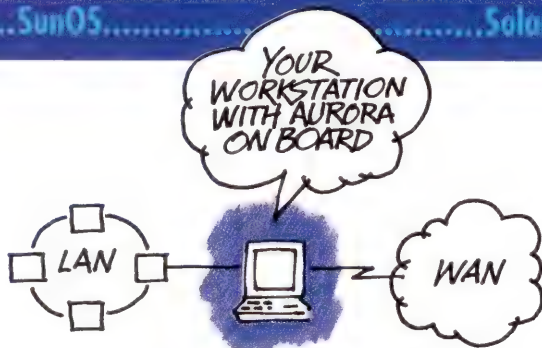
The following routines are available in NS only. A program must be critical when calling them.

Fetch_NRV_Index—Returns the five word NRV table entry given the table index.
Fetch_NRV_IP—Returns the NRV entry and index given the IP address.
Fetch_NRV_Router—Returns the NRV entry and index given the router address

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(DS node number).

Fetch_MA_Index—Returns the 10 word MA table entry given the index.

Fetch_MA_Node—Returns the MA table entry and index (in B register) given the node number (router address). This one uses the NOABORT type of return. The value returned in the A register is meaningless.

Usage:

```
$alias fetch_ma_node, noabort
integer*2 nrv_entry(5), index, node, ma_entry(10), error
integer*4 ip_addr

call fetch_nrv_index(index, nrv_entry)
call fetch_nrv_ip(ip_addr, nrv_entry, index, error)
call fetch_nrv_router(node, nrv_entry, index, error)
call fetch_ma_index(index, ma_entry)
call fetch_ma_node(node, ma_entry, *<error return>)
```

The message accounting table format is the same for NS and DS.

#NRVS and Fetch_MA_Node are in NSLIB.LIB and NSLIB_CDS.LIB. The others are in NSSYS.LIB and NSSYS_CDS.LIB.

Here is a sample program :

```
ftn7x
$climit 32767
$alias nrv_search='#NRVS', noabort
$alias fetch_ma_node, noabort

program test
implicit none
integer*2      parms(5), node, lu, index, wkmap, error,
+             ma_entry(10), dummy
logical        found

call rmpar(parms)                ! get node number from runstring
node = parms(1)

call nrv_search(node,*90)        ! search NRV for this node

call abreg(lu, index)

write(1,*) 'Node', node, ' Lu =', lu, ' NRV index =', index

                                ! get the MA table entry
call ds_entercritical(wkmap, error)
if (error .eq. 0) then
```


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```

    found = .false.
    call fetch_ma_node(node, ma_entry, *80)
    call abreg(dummy, index)
    found = .true.

80    call ds_leavecritical(wkmap)
    else
        write(1,*) 'Enter critical error =', error
    end if

    if (found) then
        write(1,*) 'MA index =', index,
+           Status =', iand(ma_entry(2), 3b)
    else
        write(1,*) 'Node not found in MA table.'
    end if
```

```

    stop

90    write (1,*) 'Node', node, ' not found in NRV'

    end
```

Walt Boeninger works in the HP Response Center in Mountain View, California. He has been supporting the HP 1000 for 15 years. His e-mail address is: walt@hpwrcx.mayfield.hp.com.



HP-RT Topics

by Anita Harris

HP-RT: A Real-Time OS

THE JULY 1995 HP-RT column addressed several questions that were affecting many current HP-RT customers and I wanted to get the information out to assist them as soon as possible. This did seem a bit out of order, however. So now, I would like to go back to the beginning, for those of you who may be new to Real Time, with some more basic questions and answers along with a bit of specific technical information for good measure.

Q: What is HP-RT?

A: HP-RT stands for Hewlett-Packard Real Time. It is HP's newest real-time operating system with real-time capability tuned for the HP PA-RISC platform. It was designed to be interruptible by both internal and external requests and respond to those requests within a predictable and guaranteed time frame (less than 100 microseconds). HP-RT is based on LynxOS (a real-time systems kernel by Lynx Real-Time Systems Inc.) with additional functionality added by Hewlett-Packard. It is an industry-standards-based OS complying to IEEE POSIX.1 and following POSIX.4 draft 9/10 for real-time extensions and POSIX.4a draft 3/4 for process level threads. It also provides many System V Interface Definitions (SVID) and Berkeley Software Distribution (BSD) features.

The OS has also been modified to run on PA-RISC systems. HP-RT is currently supported on the HP 9000 Series 742rt and 743rt VMEbus (Versa Module

Eurocard) board computers. This will extend to the VXI industry with the V743rt VXI controller for Release 2.1. There are plans to expand to other PA-RISC platforms in the near future.

Q: Just what is a real-time operating system?

A: A real-time OS is one used when a very fast reaction or response to an event is needed or large amounts of data must be processed rapidly. The operating system and applications are more tightly integrated than other traditional operating systems. A classic example of an application requiring real-time is an alarm tied to a heart monitor. Another example would be the monitoring and control of a nuclear reactor. Less than real-time response in these situations could mean disastrous results.

There are other time-sharing systems with fast response time, but in order to be considered real-time systems, they must be able to service an interrupt within a fixed and predictable period of time. If an interrupt or event occurs and the system must first finish its current task before the interrupt is handled, there is no way to determine how long it will be until the system responds. This does not represent a real-time system.

In the HP-RT OS, the scheduler will preempt a process with a lower priority to give a higher priority process the CPU. Thus, each application is given a priority. When a process with the highest priority needs the CPU, it will be assured

of obtaining it as long as another higher priority process doesn't intervene.

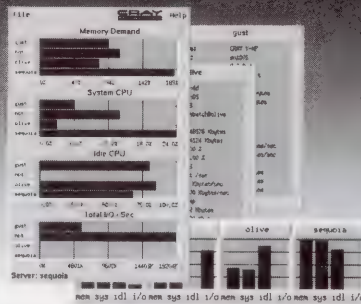
Q: I am used to doing HP-UX development work. How different is the development environment for HP-RT?

A: Currently the development for HP-RT applications is done on an HP-UX Series 700 or Series 800 host system. Application development time is reduced since you do not need to learn a new development environment. HP-RT kernels are created on the HP-UX system and downloaded to the HP-RT system by booting from HP-UX or moving the kernel to a disk connected to the HP-RT processor. There are no development tools available on the HP-RT OS.

You use the same development and debugger tools as you would for HP-UX applications. We also provide a script, *crt*, as an interface to the HP C compiler and linker. *crt* sets the search path for include files and libraries to point to the correct HP-RT files to assist the developer in linking the applications for the HP-RT system. The arguments and options to *crt* are the same as those defined for *cc*.

The HP-RT debugger for applications is called *rtdb*. It is a version of HP-UX's *xdb* that has been enhanced to debug processes on a remote HP-RT system. HP-RT's *rtdb* itself runs under HP-UX and uses TCP sockets to communicate with a Ptrace Server Daemon (*pt_srv*) running on the remote HP-RT system where the process to debug is run. Since HP-RT supports process-level

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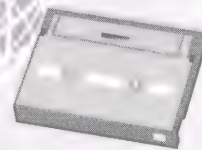
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threads, *rtdb* is enhanced to assist the user in debugging processes using this capability.

HP-RT's Kernel/Driver Symbolic Debugger is *pdb*. *pdb* is a symbolic debugger that can be used for debugging user-written drivers. HP-RT source code can also be purchased as a product allowing the entire HP-RT Kernel to be debugged at the source-code level. Note that kernel source is not required to debug a user-written driver installed in the kernel. *pdb* is also based on the *xdb* debugger technology, sharing the same command syntax with *xdb*.

The *pdb* debugger is executed on the HP-UX host system, while allowing you to debug code executing separately on the HP-RT target system. It is normally started at HP-RT boot time, but it can be used at any time if the system was booted with the proper flags and *pdb* is started with the correct options. You need to have the identical HP-RT kernel executable existing on the HP-UX host for *pdb*'s use and you must also have available the driver source code to be debugged.

Q: What languages can I use to do development work?

A: The HP-RT Developer's Kit supports HP C/ANSI C, C++, FORTRAN, and HP-PA Assembly. Some developers currently use Ada with the HP-RT run-time libraries. HP doesn't currently support Ada but may support it in the future.

Q: How are HP-RT kernels made if the development environment is on HP-UX?

A: When the HP-RT software is first installed on the HP-UX host, the host must be configured for HP-RT. HP provides the *HPRTadm* script to do this for you. The development environment is set up for you to construct either a disk-based or a ramdisk-based system.

A configuration file, *CONFIG.TBL*, is provided for modification to add additional drivers to the system. A system parameter file, *param.h*, is provided for you to fine-tune your HP-RT kernel. The *sysdev.h* file contains entries that define the I/O configuration of the operating system. These entries can be altered to meet your system needs. The *HPRTadm* script can then be used to assist in making custom ramdisk-based and disk-based kernels. Just select the desired option from the menu and answer the questions to include the specific options and products required for your system. The script invokes *make*, which uses your answers plus the configuration and parameter files to build your new kernel for you.

Q: Can I boot the HP-RT system without an HP-UX host?

A: Most customers currently boot HP-RT ramdisk-based systems from HP-UX hosts. This is done either across a LAN or via the VME backplane using the HP-RT VME Backplane Networking prod-

uct. The HP-UX host is set up as an NFS server for use by the HP-RT ramdisk-based client for convenient access to data and applications over the network. Disk-based kernels can be booted both from supported SCSI disks and PCMCIA adapter flash cards, once installed from an HP-UX host.

When you run the *HPRTadm* script to configure HP-RT on the HP-UX host system, it not only sets up the HP-UX host for doing development work but also creates two bootable kernel files. One is an "install kernel" file. The other is a "disk-based kernel" file. These kernels are used for the sole purpose of installing a disk-based kernel to disk. The ramdisk install kernel is booted on the HP-RT processor to set up the disk and its file system and copy the disk-based kernel to disk. Then the disk-based kernel can be booted and you are ready to make any file modifications for your specific needs. Once you can boot a disk-based system, new customized disk-based kernels can then be ftp'd to the disk and the system can be booted from the new kernel file.

Note that installation of the disk-based kernel is the sole purpose of the install kernel, as it is created to manage space efficiently and uses a limited system parameter file. Do not use this kernel to run applications. You will run out of resources very quickly.

Q: What networking services are supported with HP-RT?

A: HP-RT networking services include NFS and ARPA/Berkeley ser-

vices. These use TCP/IP protocols using the provided Ethernet driver or the add-on VMEbus Backplane driver. Using the Ethernet driver and LAN hardware, the HP-RT system can communicate to any system on the network. Only systems in the same VME backplane can communicate via the VMEbus Backplane driver. Full NFS is provided allowing the HP-RT system to be both NFS client and server. ARPA/Berkeley services provided are the standard telnet, rlogin, remsh, ftp, rcp, and Berkeley sockets.

Q: What graphics capability does HP-RT have?

A: Common X11 clients and libraries are supported with the HP-RT Developer's Kit so you can write X and OSF/Motif clients that can be viewed on any remote X display connected to workstations or X terminals. With the 2.1 Revision of HP-RT the new X11 SERVERrt product will be supported. This will allow the use of a graphics monitor with keyboard and mouse on HP 9000 Series 743rt VME computers and Model V743rt VXI controllers. The monitor can be the system console or a standard graphics display. The 743rt VME computer can be purchased with on-board graphics or one add-on mezzanine graphics card; the VXI controllers come with the on-board graphics hardware. Both support one graphics monitor or flat panel display. If you use the 743rt with the mezza-

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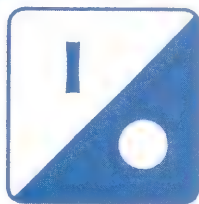
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nine graphics card, be aware that it will need to occupy two VME slots and you will need to install an HP A4262A expansion kit.

Q: I have applications and drivers written using System V STREAMS programmatic facility. Can I port these to HP-RT?

A: A separate product called STREAMSrt can be used in the HP-RT environment for your System V STREAMS applications and drivers. STREAMSrt conforms to System V STREAMS with two exceptions. First, STREAMSrt uses a kernel thread to implement the master scheduler that is responsible for calling the correct service procedure with the right queue argument. The System V STREAMS master scheduler monitors each queue and determines which service procedure needs to be called. The System V STREAMS service procedures are invoked as a part of the STREAMS scheduling mechanism and the STREAMSrt thread is enabled when a task needs a service procedure.

The second difference is the way the kernel function protection is implemented. System V STREAMS uses the *splstr()* utility and *splx()* kernel function to change the module and driver interrupt levels so the STREAMS kernel functions are not affected by interrupt handlers. When using STREAMSrt, a global semaphore called *str_sem* is used mutually to exclude other threads from performing STREAMS opera-

tions when a kernel thread has called a STREAMS kernel function. This allows interrupts and task preemption even when a STREAMS kernel function is executing. So your drivers may require a few changes to implement the exceptions mentioned above, but your user-level applications shouldn't need modifications to move them to the HP-RT environment.

At Release 2.1, STREAMSrt is enhanced to support the Data Link Provider Interface (DLPI). DLPI is a STREAMS-based implementation of the service specification of the IEEE ISO DIS 8886 and ISO 8802 Logical Link Control standard.

Q: Can I use the HP-RT real-time system as an accurate time source?

A: Real-time means deterministic response time and does not imply any type of time accuracy. The accuracy of the system depends on the frequency of the crystal on the processor and is subject to environmental changes such as temperature and moisture. Take the 743rt processor, for example. It should be accurate to +/- 8.65 seconds per 24-hour time period when the temperature ranges between 0°C to 70°C. The firmware provides the OS with a value representing the number of CPU clock cycles that will occur in 10 ms. The OS uses this information with an internal counter to keep track of the time. The accuracy is therefore subject to the actual number of cycles that will occur in 10 ms and the value the OS uses to count the cycles it

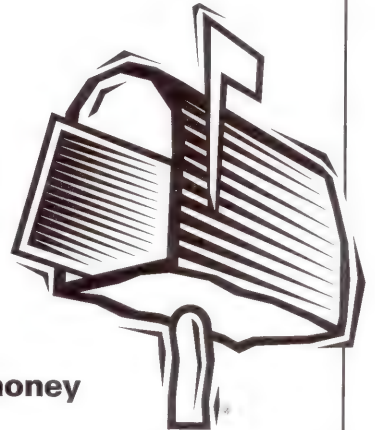
expects to equal 10 ms.

Release 2.1 of HP-RT includes a system call called *adjtime()*, which allows the system clock to be adjusted according to a value obtained from an external, accurate source. It will speed up or slow down the HP-RT system clock, as necessary, in small increments, ensuring that time is always moving forward. Use it in applications that function as time servers synchronizing system clocks on a network. ■

HP-RT operating system questions are answered by Anita Harris, a support engineer in the HP-RT Expert Center. She has worked with Real-Time systems for eleven years as a customer, a Real-Time Response Center Engineer, and HP-RT Expert Center Engineer.

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Expanded Program proved to be successful at Interex '95



Interex '95 in Toronto, Ontario, Canada, offered participants an array of keynotes and a more broadly focused program than in the past to help them face a challenging future.

Lew Platt, Hewlett-Packard's chairman, president, and CEO, told an overflow audience at the Convention Center ballroom that HP intends to capitalize on the opportunities presented by "a turbulent era of information convergence."

In an address on HP 9000 Series 800 Product Line Strategy, Carol Mills, general manager of HP's General Systems Division, spoke of HP's "Solutions for the Real World," which she believes all of us are seeking.

HP 3000 users learned from Olivier Helleboid, HP's general manager of the Commercial Systems Division, that in the future MPE and UNIX will be working together much more closely. He spoke of multiplatform productivity, data interoperability, and "worry-free computing in a changing world."

Hands-on opportunities were plentiful. At the HP Solution Center, visited by Platt, attendees were given an opportunity to view the latest UNIX and MPE technologies and to test-drive a diverse set of HP 3000 and HP 9000 products, including networking and graphics technologies. An Internet access area gave participants an opportunity to access e-mail and also to receive Internet training. Most vendors on the Expo floor also offered hands-on experience, and several offered classes.

The number of UNIX sessions was considerably higher than in the past. This year, InterWorks, now part of Interex and known as the InterWorks Technical Users Forum, sported a special information desk within the Interex booth.





1. Carol Mills gives Product Line Strategy address.
2. Attendees get hands-on instruction at training seminar.
3. Vendors at the Expo demonstrate the latest products.



photos by Rom Wright

New this year was the Interex Management Symposium, an intensive full-day event focusing on best practices in system development and political effectiveness, with training sessions led by the popular Dr. James Wetherbe.

The HP Manufacturing Productivity Users' Conference, also new, gave manufacturing professionals a chance to address business needs at their sites. And a much expanded series of training seminars, from client-server to migrating to HP-UX 10.0, drew record numbers of attendees.

This year, six roundtables, including a new one on client-server, gave participants a chance to fire questions at panelists with a wide spectrum of expertise on HP-UX, MPE, RTE, HP Support, and client-server. The ever-popular

Management Roundtable, a key forum offering participants direct interaction with HP managers, touched on a wide variety of concerns.

At a special press conference, Interex announced the final results of the 1995 Interex Advocacy Survey, designed to identify the key trends and top strategic concerns of MIS and high-level managers at HP installed base customer sites worldwide. Overall, there was improvement in HP's satisfaction ratings over the 1994 survey, but 1995 numbers still indicate continuing dissatisfaction with HP sales support. The annual survey is an essential part of the Interex advocacy program, designed to define users' needs and present them to HP with documentation. Also meeting at the conference were many special interest groups, serving as advocacy forums influencing the direction of HP products and services.

See you at Interex '96 in Anaheim, California, August 5-9.

4. Users try out Internet Access.
5. Participants receive on-the-spot information on Interex Online Services.
6. Conferees at the Expo receive first-hand information about the new InterWorks Technical Users Forum.
7. Lew Platt visits Solution Center.

by Joe Berry

THE INTERNET HAS BEEN a lot busier these last two months. People are submitting software to a variety of different Usenet newsgroups. If you are monitoring the Internet for new software, be sure to extend the set of newsgroups being monitored.

COMP.MISC

Inter-Network Mail Guide

This news group features a variety of offerings that might be useful to the intrepid networker. In particular, Scott Yanoff frequently publishes two interesting guides. The first is called the Inter-Network Mail Guide. It is available via ftp from <ftp.csd.uwm.edu> or can be accessed via a WWW search engine from <http://alpha.acast.nova.edu/cgi-bin/inmgq.pl>.

The guide documents methods of sending mail from one network to another. I'll present a couple of examples to demonstrate its contents. If you're on the Internet and want to send mail to someone who has an account on CompuServe, the following entry explains how to do it:

```
FROM: internet
TO: compuserve
RECIPIENT: 71234,567
INSTR: send to '71234.567@CompuServe.com'
INSTR: Ordinary Compuserve account IDs are pairs of octal numbers
```

If you are on CompuServe and want to send a fax, here are the instructions:

```
FROM: compuserve
TO: fax
RECIPIENT: +1 415 555 1212
INSTR: send to '>FAX:14155551212'
INSTR: not transitive - message must originate from a CompuServe user
INSTR: for calls outside the NANP, use the appropriate country/city codes
```

If you have a friend working at IBM but don't know how to reach him or her, the guide gives you these instructions:

```
FROM: internet
TO: ibm
RECIPIENT: USER at VMNODE or (VMNODE)USER <- this is the internal syntax
CONTACT: nic@vnet.ibm.com
INSTR: send to 'user@vmnode.vnet.ibm.com'
INSTR: The recipient has to be registered for internet email, to look up
INSTR: whether he is or not, mail to nic@vnet.ibm.com with
INSTR: the line 'WHOIS LASTNAME, FIRSTNAME' in the message body.
```


Internet Services List

The second guide submitted by Yanoff is the Internet Services List. You can type

```
finger yanoff@alpha2.csd.uwm.edu
```

to find ways to receive the List.

This list contains over 1,600 lines of services and other goodies (both ftp and WWW accessible) that are sure to include information of interest to everyone. A couple of examples follow:

Chess Servers

```
telnet anemone.daimi.aau.dk 5000 or 130.225.18.58 5000
telnet dds.hacktic.nl 5000 or telnet 193.78.33.69 5000
telnet lux.latrobe.edu.au 5000 or 131.172.4.3 5000
```

Earthquake Information

```
finger spyder@dmc.iris.washington.edu [WORLD]
finger quake@gldfs.cr.usgs.gov [UNITED STATES]
finger quake@seismo.emr.ca [CANADA]
```

Ham Radio Callbooks

```
telnet callsign.cs.buffalo.edu 2000 / 128.205.32.2 2000
telnet ns.risc.net or 155.212.2.2 (Login: hamradio)
```

Law Library

```
telnet liberty.uc.wlu.edu or telnet 137.113.10.35
ftp sulaw.law.su.oz.au (cd /pub/law)
offers: Law libraries and legal research. (Login/
password: lawlib)
Offers copies of laws for each state/computer laws
telnet lawlib.wuacc.edu or telnet 192.104.1.6
offers: American Association of Law Libraries Info.
System (Login: aallnet)
```

COMP.WINDOWS.X.ANNOUNCE

Tix 4.ob4

Tix is a library that extends the *Tk* toolkit. It contains over 20 new widgets for *Tk*. If you're not a *Tcl/Tk* user (particularly a programmer) then this software will not interest you. But if you are, then you should really see what this product offers.

The new widgets offered include Motif and/or MS Windows style *FileSelectBox* widgets, *NoteBook* widgets, *Directory List/Tree View* widgets, and many more. The software also

supports the XPM image format.

Tix allows for better connectivity to the Motif Window Manager (*mwm*) through the use of the *tixMwm* command. You can even add new items to the system menu and change the window manager decorations.

To get the software, grab the following file off of site *ftp.cis.upenn.edu: /pub/loi/Tix4.0b4.tar.gz*. To obtain additional information about *Tix*, you can access the following Web site: *http://www.cis.upenn.edu/~loi/tix/tix.html*. While the software is copyrighted, it is released under "very liberal license terms, similar to the *Tcl/TK* license terms." Information is available in the file *docs/LEGAL.html* in the distribution.

Xalarm 3.06

Every year or so at least one more alarm clock program appears on the Internet. This year's entry is *xalarm* by Simon Marshall from Rome, Italy. I've started using it; it really is easy to use and seems to perform well enough. Alarms can be set interactively, through command-line options, or from a file. The software includes a snooze feature allowing you to be late for the appointment you have set but reminding you periodically later on.

Building the software simply entails running *xmkmf* followed by *make*. If you think you might want such an alarm clock program, try this one out. You can build and test it in less than five minutes and see for yourself if this program meets your needs. The software is available from *ftp.x.org:/contrib/utilities/xalarm-3.06.tar.gz*.

COMP.UNIX.PROGRAMMER

tywatcher 1.0a

Unfortunately, this program is not yet available on HP systems. *Ttywatcher* is contributed by En Garde Systems and currently runs only on SunOS 4.x and Solaris 2.x systems. If any adventurous soul wishes to port the program to an HP-UX system, he will undoubtedly gain lots of popularity.

Ttywatcher is a utility program that monitors and controls users on a single system. The program can share an existing, in-use *tty* so that when the user types something into the monitored window, the information will also appear on the *tywatcher* window. The *tywatcher* user can even enter something in his window that the real user will see. In this way, a login session can actually be shared between two users. This is a great way to help users/students quickly and interactively

who are stuck with some facet of their work.

The software is available from coast.cs.purdue.edu as file [/pub/tools/unix/ttywatcher/ttywatcher-1.0.tar.gz](http://pub/tools/unix/ttywatcher/ttywatcher-1.0.tar.gz).

COMP.SYS.HP.HPUX

lsdf 3.32

Vic Abell from Purdue University has been supporting *lsdf* for quite a while now. *lsdf* stands for "LiSt Open Files" and that is exactly what the program does. Using the same command style as the standard UNIX *ls* command, *lsdf* returns information about open files for a particular user, for a particular pid, or even for the entire system. This program is useful when you want to unmount a file system but cannot because some file is open on that file system and you don't know which one.

lsdf accepts a number of different filters for displaying just the information you want. Some of the more powerful filters include listing open files by the user name, all NFS files, and all uses of a specific file. And the best thing yet is that this utility is compatible with both HP-UX 9.0 as well as HP-UX 10.0.

lsdf can be obtained via anonymous ftp from vic.cc.purdue.edu by looking in the directory pub/tools/unix/lsdf.

ALT.SOURCES

di 1.18

This neat little utility returns information about the capacities and sizes of the disks currently mounted on the system. The program output appears very much like *df* output. In fact, *di* was written to act as a system-independent version of *df* since *df* output varies so much from platform to platform. For example, to display the amount of free space in all file systems on a system in kilobytes, the command on IBM AIX systems is *df*, the command on HP-UX systems is *bd*, and the command on Sun Solaris systems is *df-k*. By building this utility on each of your systems, you can impose a uniform output format that can be taken advantage of in user scripts that will work across all platforms.

Many display options are available to tailor the output to the particular needs of the user. The program is easy to build and works on dozens of different platforms. *di* was written by Brad Lanam (bll@gentoo.com). I tried looking for it on the Internet using archie but could not find it anywhere. You might try asking the author for the code. I do have it also and wouldn't mind e-mailing a uuencoded, tarred, and gzipped version to anyone wishing it.

WWW

<http://www.coast.net/SimTel/>

The Simtel computer, containing a huge repository of PC-oriented software, used to be maintained by the U.S. military. I remember that it always seemed odd to me to ftp to *something.simtel.mil* to access PC software. Then Simtel died. Or I thought it had. A friend of mine recently asked me to try to locate a certain educational program for him that runs on PCs. Scanning some of the PC-oriented Usenet newsgroups, I saw a posted list of new Simtel files. Simtel is alive and well.

SimTel, the Coast to Coast Software Repository (tm), is the largest collection of MS-DOS and MS-Windows programs on the Internet (over 11,000 files). It is mirrored by more than 60 sites around the world.

SimTel has both MS-DOS and Windows programs in its collection and all incoming files are scanned for viruses and Trojans. They are also reviewed for content and authenticity by professional archivists. SimTel does not accept anonymous uploads.

<http://www.odci.gov/ic>

I have recently been reading a lot of Tom Clancy's spy novels. His books delve heavily into the intelligence-gathering communities of various countries. This home page leads the user into the 13 offices that comprise the United States Intelligence Community. From here, for example, you can obtain information on the Central Intelligence Agency (CIA) as well as the Federal Bureau of Investigation (FBI). While there is not a lot of information (what did you expect, the names of spies?), they do list documents and maps that can be purchased. As an example, for \$15.50 you can purchase a wall-size map showing populated places, major roads, etc., in the Middle East (map #801720).

<http://www.lacma.org/>

If you would like to see an example of beautiful Web page design and presentation, come to the Los Angeles County Museum of Art home page. Make sure however that you have a high-speed Internet connection since everything presented here is very graphical.

<http://alpha.mic.dundee.ac.uk/ft/stories/reports.html>

I came across this WWW page accidentally (I won't tell you how). This is the home page for *Fortean Times*, *The Journal of Strange Phenomena*. And strange it is. Many different subjects are

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presented. One is entitled "Fire in the Sky UFOS" with its stories of the meteorite that destroyed a mobile home (I heard that one on the radio the morning after the incident occurred) and the famous autopsy film.

Another subject heading is "Newly found peoples and animals" with a story about a recently discovered Indonesian cannibal tribe. Under subject "Strange Deaths" you can read about the six people who died trying to save a chicken that had fallen into a well (the chicken survived) and other gruesome variations of how people have recently died. This Web page is guaranteed to add information to your cocktail party repertoire. ■

Joe Berry is a senior software developer at Landmark Systems Corporation in Vienna, Virginia. He is one of the authors of Landmark's performance monitor, TMON for UNIX. A former HP 3000 systems specialist for Hewlett-Packard, he has been in the computer industry for more 20 years. He can be reached at joe@landmark.com.

by Larry Headlund

Xtent

ONE MEASURE OF THE power of an idea is how many variations can be played on it. A really fertile idea will nourish many implementations by various authors. One of these fecund ideas is the X resource set. The notion of placing much of the appearance of an application outside of the code fits in well with the client-server model and the distinction between user interface and function. But once you have gone this far, why not go further? If you can define so much of the appearance of a program in the resource files, why not some behavior also?

The first implementation of this idea, to my knowledge, was David Symthe's Widget Creation Library (WCL). This is one of my favorite tools and I have talked about it at length here. Some might say too often and at too much length, but I am an enthusiast.

Another take on resources as programming language is from David Flanagan in his book *Motif Power Tools*

from O'Reilly. His is an alternative path from WCL, which he acknowledges. He has a very elegant construct for creating option menus. The third path is from Doug Blewett of Bell Labs and is called xtent.

Why do programming through the resources?

The prime advantage has to be that resources are interpreted at run time. This cuts the middle out of the code-compile-link-run cycle of program development. This is not as important as it was when compiling and linking were so slow (back when it was said that all programmers knew how to juggle, because they had time to practice waiting for compiles to complete). Even now, the immediate feedback speeds up development. The run-time interpretation also means that your applications are very customizable at the end user's site. You may or may not like giving this power to distributed sites, but I find it very useful. Dramatic changes

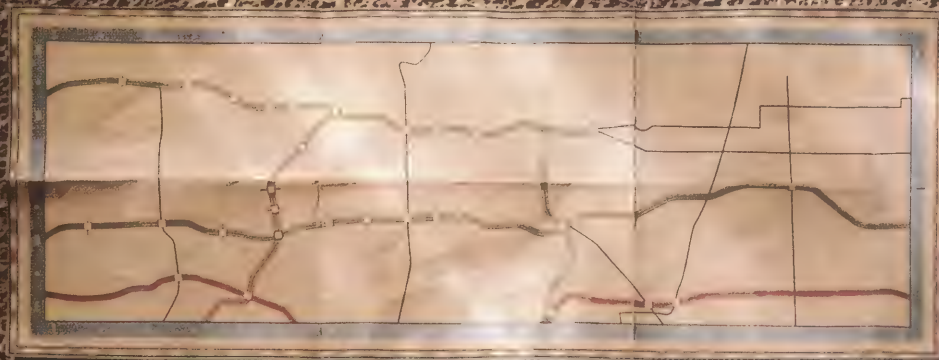
LISTING 1

```
!!! Display date to standard out until button is pressed

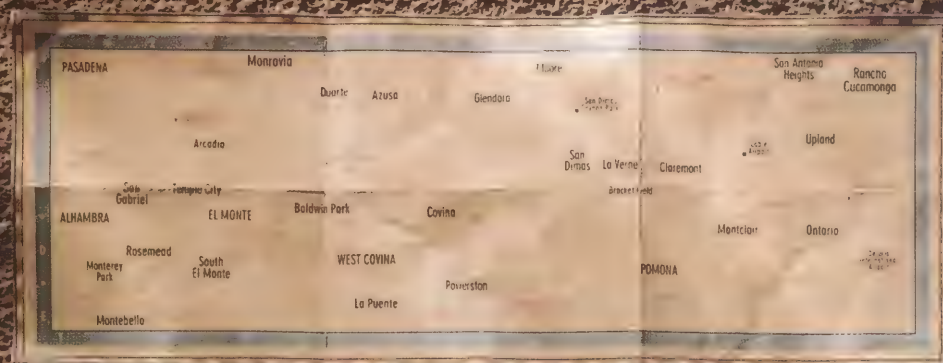
*traversalOn: False
.XtSetShellVariables: (SHELL, /bin/sh)

!!!
!!! create a simple oblong with a callback
!!!
.button.labelString: Push to Stop the Date
.button.XtCreateManagedWidget: xmPushButton
.button.dismissCallback.Xt_AddCallback: \
    (.XtRemoveWorkProc: (.Xt_ShellEscape: (sh -c "(date; sleep 1)"))))

!!!
!!! startup a work proc
!!!
.Xt_AppAddWorkProc: (.Xt_ShellEscape: (sh -c "(date; sleep 1)"))
```

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in appearance and behavior can be made without touching the executable.

Programming with resources also helps me to focus on the user interface separately from other functions. This is a big help when you move to internationalization or switch to an RPC model for interaction.

Also, you have to understand X resources anyway to do effective X programming, so why not leverage that knowledge for all it is worth?

How Xtent Works

Xtent is a simple function-oriented language that uses a syntax based on the syntax of X resource files. An xtent program looks like an X resource file mixed with C/C++ and a simple Lisp. The result is not as strange as the description. See *Listing 1* for a simple button press application. Unlike WCL or Flannagan's Motif Tools, the X way of fetching resources through XAPPLRESDIR, XENVIRONMENT, LANG, etc. is not used. Instead xtent takes its commands from standard input, so running an application looks like `xtent < myfile.xt`. This is one of the things I am not so enthusiastic about. I like having the power of the X resource path at my disposal. Besides the obvious uses for internationalization, I can use changes in the resource search path to add or deny functionality for particular users. The road xtent has taken is similar in this regard to that taken by Steve Pendergast with his Windowing Korn Shell.

The three strong features that distinguish xtent from the other resource-based tools are an embedded programming language, full access to the X Toolkit, and powerful interprocess communication tools. The last reflects the authors'

LISTING 2

```
title: Silly Reparent Example
.iconName: Silly Reparent Example

!!!
!!!  global settings
!!!
*traversalOn: False
*background: grey
*fontList: -adobe-helvetica-bold-r-normal-*14-*

!!!
!!!  toplevel container
!!!
.rc.orientation: XmVERTICAL
.rc.adjustLast: True
.rc.XtCreateManagedWidget: xmRowColumn

!!!
!!!  control buttons
!!!
.rc.buttons.orientation: XmHORIZONTAL
.rc.buttons.adjustLast: True
.rc.buttons.XtCreateManagedWidget: xmRowColumn

.rc.buttons.previous.XtCreateManagedWidget: xmPushButton

.rc.buttons.next.XtCreateManagedWidget: xmPushButton

.rc.buttons.delete.XtCreateManagedWidget: xmPushButton

.rc.buttons.pause.XtCreateManagedWidget: xmPushButton

.rc.buttons.continue.XtCreateManagedWidget: xmPushButton
.rc.buttons.continue.XtSetSensitive: False
.rc.buttons.exit.XtCreateManagedWidget: xmPushButton
.rc.buttons.exit.disarmCallback.Xt_AddCallback: .XtExit:

!!!
!!!  put the text field within a scrolled window
!!!
.rc.sw.scrollingPolicy: XmAUTOMATIC
.rc.sw.visualPolicy: XmVARIABLE
.rc.sw.height: 128
.rc.sw.XtCreateManagedWidget: xmScrolledWindow

!!!
!!!  set the shell for shell escapes
!!!
.XtSetShellVariables: (SHELL, /bin/sh)
!!!
!!!  a function to reparent a specific window for use with a stub widget.
!!!  This function run through a fifo once the xterm window ID is
!!!  known.
!!!
.XtAddFunction: (AddXterm, add_xterm, xterm.window)
add_xterm: .Xt_Eval:
```


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interex

*Shared Knowledge.
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LISTING 2 *continued*

```
(
.rc.sw*draw.XtVaCreateManagedWidget: (xmDrawingArea),
.rc.sw*draw.XtSetValues: (width, 500, height, 318),
.rc.sw*draw.XtReparentWindow: (^xterm.window), 0, 0),
.XtShellEscape: rm ^(file),
.XtAppAddTimeOut: (1000, .XtRemoveInput: ^(file)),
!
.XtMoveWidget: (100, 100)
)
#
!!!
!!!  setup a fifo for adding the xterm window id
!!!
.XtShellEscape:# echo "file: /tmp/$$fifo"
.XtShellEscape: /etc/mknod ^(file) p
.XtShellEscape: echo > ^(file) &
.XtAppAddInput: ^(file)

!!!
!!!  run the xterm - and have it automatically install itself
!!!
.XtShellEscape: \
xterm -xrm "xterm.overrideRedirect: True" \
    -xrm "xterm.x: -3000" \
    -e sh -c 'echo .XtAddXterm:$WINDOWID > ^(file);ksh -i' &
!.XtAppAddInput: /dev/tty
```

philosophy that the way to build applications is with groups of communicating processes. As with Software Tools, the way to build strong applications is with short and simple parts. Hence they made sure there were robust tools for communication built into their language. Full access to the X toolkit means that anything you can do with a C program using Xt calls you can do inside of xtent. Listing 2 shows them reparenting an xterm entirely within xtent. The third feature, an embedded language, needs some more discussion.

The embedded language supplied with xtent is not the prettiest thing in the world. However, its authors say it is very fast and efficient. The language could be used as an embedded language

for non-GUI programs but its real advantage is in making simple things simple. While WCL can manage and unmanage widgets, popup and popdown and so on, you cannot, completely within WCL, do even simple logic actions. Something as simple as "if a file exists do such and so" is beyond its capabilities. So is combining the values of text widgets to come up with a new value and using it. So even simple user dialogues are going to need some C code. With xtent simple things can be done within the language. Even complicated things, like a resource editor, are included as examples.

An obvious alternative to xtent is Tcl. Tcl also can do simple GUI programming simply and glue programs

together. What xtent brings to the table is the Xt completeness, the resource file syntax, and a simpler language than Tcl.

Making Xtent

The first thing is to get a copy of the source. The whole package is available from

ftp.x.org/contrib/devel_tools/xtent.3.2.tar.Z

The package is released under an X type license, which means you can do anything you want with it, including embedding it in proprietary code, provided you keep the copyright notice in the code and also in any documentation. You are going to need an ANSI C compiler for this code, as there are no `#ifdef _NO_PROTO` flags or K&R function definitions. You will also need *imake* and its cousins installed and correctly configured on your system.

The instructions in the README indicate you may have to make changes in two files, *defines.imake* and *defines.MOTIF*. My changes under HP-UX 9.04 for both 700 and 800 machines were limited to redefining CPDIR in *imake.defines* to be the directory where I was working and two changes in *defines.MOTIF*. I changed WIDGETLIB to equal `-L/usr/lib/Motif1.2` and `-lXm` and WIDGETDIR to equal `/usr/include/Motif1.2/Xm`.

There was one HP-specific change I had to make that was not in the README. The tiff library, which is originally from Sam Leffler and is included so that some applications can read image and fax files (!), includes a module implementing *getopt*. Now *getopt* is also implemented by HP and the HP ANSI C compiler complained bitterly and refused to continue when the arguments to the Leffler *getopt* did not match

the HP prototypes. I got around this by removing *getopt.c* and *getopt.o* from the *Imakefile* for *tiff/tools*. HP-UX supplies these tools and the function is there for those benighted systems where *getopt* is not standard.

With these changes the make went through with no problems.

Conclusion

Xtent is not the perfect tool. I like to be able to use the X paths for finding resources. I am also very used to the WCL way of doing things, especially templates. However, someone without my prejudices could get very enthusiastic. ■

Larry Headlund is president of Eikonal Systems, a UNIX/X consulting firm. He has been working with commercial UNIX since 1982 and with X since 1987. He can be reached at lmh@world.std.com or (617) 482-3345.

Interex '95 Conference Proceedings

The Conference Proceedings are a great way for HP users to capture all the information available at the conference. The proceedings from Interex '95 in Toronto contain final paper presentations of all scheduled sessions. If you were unable to attend the conference, you can catch up on all the sessions you missed. All CSL/Site-level members who did not attend the conference automatically received a copy of the proceedings following the event, but additional copies are available.

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CSL Perspective

AN ARTICLE IN THE August 14th issue of *Information Week* detailed the results of a poll on the use of freeware and shareware amongst *IW*'s readers. I can't say I was surprised by the results since they validated many of my own sentiments. The tone of the article was somewhat negative, emphasizing the risks and not providing much balance in terms of the benefits of using freeware. I thought it would be good to spend some time discussing the issue.

The challenges we face today are significant. These challenges include rapid technological advances, ever increasing complexity that hides behind the easy-to-use interface, and skills shortages in the emerging technologies. The most significant and common trend that we face is decreasing cycle times. In order to stay in business, organizations are being forced to adapt to this reality. Product life cycles used to be 8 to 10 years; today products need to be in the marketplace in 12 to 18 months.

This shortening of cycle times has significant implications for both the organizational models we work in and for the computing environments that many of us support. In the "old days," development teams emphasized functionality and optimization in their software, taking advantage of features in languages and operating systems that delivered a high return on investment. What were sacrificed were flexibility and adaptability, two key attributes at the foundation of today's computing architectures.

Vendors too marketed their products based on functionality and optimization. Product evaluations and subsequent platform selections were based primarily on how well a product met a laundry list of functional criteria. After all, if we were going to invest company resources, it

made a lot of sense to get as much as possible out of our systems. We got in trouble when, as our organizations and businesses changed, the functional requirements changed as well. The systems could not adapt to these changes since they were not designed to.

The primary benefit of public-domain software is that it maximizes our ability to react to shorter cycle times. By sacrificing a little functionality in the short term, you have the potential to gain some quick competitive advantages by using good, not perfect, software. This is not to say that you should stop utilizing the traditional approach of extensive product evaluation and investment. You can still undertake those activities, but using good public software in the meantime might get you to market just a little faster.

You also gain another advantage in that some functionality is simply not available from a commercial vendor right at the time you need it. A case in point is IBM 3270 terminal emulators for UNIX workstations. We have been using public domain versions for several years, as no one else, least of all IBM, offered a viable commercial product for our platforms. Therefore the choice is either to wait for a vendor to make a business out of 3270 emulation or get your users what they want now.

Many IS managers quoted in the *Information Week* article cited lack of support and low quality as two factors that keep their organizations from tapping into the public domain. These perceptions seem to be based on years of experience in the PC arena, where there is no supporting infrastructure for support and quality control. The UNIX public domain is very different. With UNIX having grown up in a cooperative, peer

group environment primarily in academia, the support of the most useful software is rendered by other users, who are not only looking for problems but making many useful enhancements. They are also driving quality improvement through the electronic communication afforded by the Internet, a virtual vendor support organization available 24 hours a day for the price of a connection.

Lack of in-house expertise was also cited as a negative factor. This is somewhat of a shallow negative, since the chances are high that a manager won't have the in-house expertise to deploy a commercial package either. While that is true in many organizations, it can be overcome through providing training to your in-house IS professionals. Vendor training is usually available for commercial software. Education and technology transfer are also activities suited to user groups like Interex. Read many of the columns in this magazine, or attend one of the conferences and you'll find many experienced users who will go out of their way to help a new user. There are also a whole host of experienced people who do support for a living and are willing to come into your organization and assist.

"Better, cheaper, faster" is not just a slick slogan; it is becoming more and more the watchword of our jobs.

In today's rapidly changing environments, we no longer have the luxury of waiting on the future. The future is already here. ■

Paul Gerwitz is chairman of the Contributed Software Library (CSL) committee and is a Senior Technology Specialist at Eastman Kodak Company in Rochester NY. He can be reached at 716-477-3067 or e-mail at gerwitz@interex.org or gerwitz@kodak.com

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Industry Watch

WINDOWS 95—NATURALLY, what else was there this past summer. The long-awaited release finally arrived amidst plenty of fanfare, and the major industry players were quick to reaffirm their commitment to everyone's favorite partner, Microsoft. (Although, IBM's formal announcement seemed a bit perfunctory.) August 24 was certainly a red-letter day for Microsoft, which claims that over 280 PC manufacturers are now preinstalling Windows 95 on their desktop and server products. That may lend some truth to the rumor that the "95" is how many billions Bill Gates expects to pull out of this. Well, that may be a slight exaggeration—but it's definitely a hot number and just about everyone wants a piece of the action.

Compaq—which has adopted the sobriquet "Microsoft's Lead Systems Partner for Windows 95"—was right there at the unveiling, with more than 80 products on display. Among the highlights: their new LTE 5000 64-bit Pentium-based notebook—PCI graphics bus, up to 72 MB RAM, integrated CD-ROM, and up to 2.7 GB internal storage.

HP, of course, is in on the action shipping select Pavilion and Vectra 500 PCs preinstalled with Windows 95. Corporate desktop models are being dual loaded with both Windows 95 and Windows for Workgroups to give users a little breathing room in making the transition. In addition to supporting Windows 95 features like Plug and Play auto-config and hot-docking, HP also jointly developed with Microsoft the infrared communications capabilities built into Win-95 for quick-n-easy wireless data exchange.

Digital is riding the Windows 95 wave with a broad joint agreement with Microsoft. First, Digital is providing

telephone support during the first 90 days from the release, and then continuing to support Windows 95 as a Worldwide Authorized Service Center for Microsoft. The agreement also grants Digital a five-year exclusive contract to manage the worldwide client-server infrastructure for The Microsoft Network, the forthcoming online service incorporated into Windows 95. (Digital is also providing its Prioris HX 590 as the server for Microsoft's Windows 95 Web page.) Finally, the two companies have agreed to joint development of solutions that combine Microsoft's client-server products with Digital's clustering technology for Windows NT users. After all that, Digital announced just days before the Win-95 launch its new Pentium-based Starion and Celebris GL PCs, presumably the first fruit of the partnership. They boast some pretty cool features, like a JBL speaker system with 3-D surround-sound, 64-bit S3 graphics, and all kinds of high-performance stuff that's supposed to make computing fun, as well as fast.

So, what about IBM? Well, they announced an agreement with Microsoft to preinstall Windows 95 on their Aptiva, PC 300 and 700 systems, and ThinkPad computers. And they're broadening their technical support to include Windows 95. Is that it? No joint development, no spinning 3-D double helices, no stereo speakers? What, are they in some kind of an OS/2 warp or something? ■

James H. Gamble is a freelance writer and communications consultant for technology-based products and services companies. He can be reached by phone at 603-673-1904 or by e-mail at jhg@mv.mv.com

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Product Focus

SDDGen

Trident Systems has announced SDDGen, designed to provide small and medium-sized software development groups with what typically only large development groups can afford—a tool that automates the development and generation of software designs and supporting documentation, allowing engineers to focus on software development.

Trident saw that all but the smallest groups of developers needed a design and documentation tool. "Anybody who develops complex software needs design documentation," said Mike Casey, marketing and sales manager of Trident's software products. He defines a "complex" software project as that which involves

more than one person for a short period. Such projects often fall prey to "a tribal knowledge problem that tends to crop up," where "design information resides only in the heads of the team members." According to Casey, such

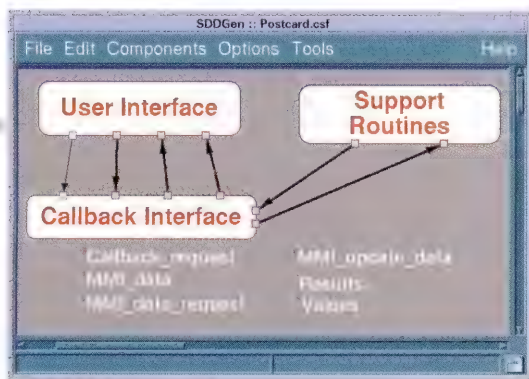
disorganized development can affect the product's long-term reliability. Not only does SDDGen organize a team's knowledge, "it allows you to keep that knowledge around, even after a person's left," Casey said.

Retailing for under \$1,200, SDDGen provides "a core set of capabilities" found in higher-end CASE tools. Casey explained, "SDDGen is a combination of graphics and word-processing capabilities that allow you to graphically design software and produce documentation of that design." Users can generate reports, templates, outlines for the development process, engineering notes, and customer-ready documents. "And you can do all this without going into a graphics package, without going into a word processing package. You only have to capture all this information once," he added.

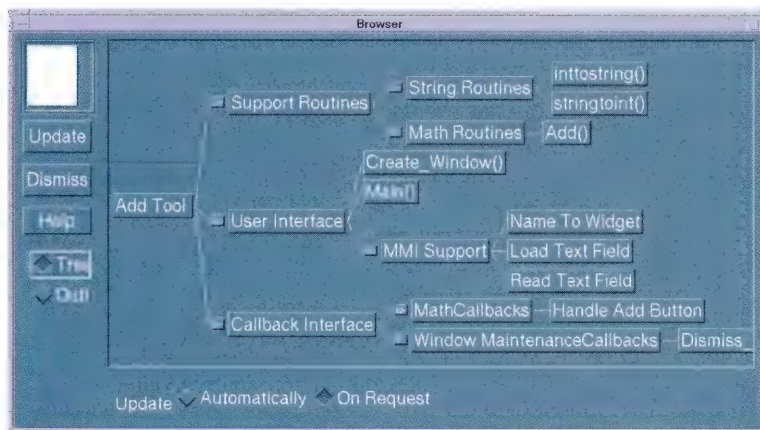
Written to run with an X Window interface, SDDGen enables developers to construct a software design and then automatically generate multiple design documents from the schematics. All changes to the code can be reflected in the documentation. In addition, a library facility allows for the same design information to be reused.

These features are available in a "multi-user environment," in which both design information and text communication can be shared across a UNIX network. "With our multi-user features, you can communicate with the rest of your team in real time, as you all develop the design together," Casey explained.

One of the tool's key features is its ability to support the decomposition of a design from the abstract to the detailed. This supports top-down design, said Casey, because a developer can capture progressively more detailed information. "You might start with four main



SDDGen's top-level view of software components



SDDGen's Browser window, which shows all design components

portions of your product. As you gain more insight into how the product's going to work, you can zoom into each main portion and add more detailed information, all the way down to executable code, if you like."

SDD*Gen* supports multiple design methodologies, including Yourdon/Demarco structured design and object-oriented design. The software design styles are customizable. "You can tailor these styles so that SDD*Gen* learns *your* approach; you don't have to learn *its* approach," Casey said.

SDD*Gen* also ensures compliance with the documented software design by generating code outlines. Casey explained, "Code outlines can be anything from a very general structure for your product to a fully executable piece of software."

SDD*Gen* comes equipped with templates for DOD-STD-2167A and object-oriented design reports, as well as text export to word-processing packages. To enable users to design their own document templates, "We provide a straightforward templating language," Casey said. "This allows the user to produce a whole variety of design products, from customer-ready design reports to executable code templates." Each design element has corresponding annotation files that can be used to describe software components, trace to requirements, or include code segments. Developers can also specify header, footer, and numbering information, as well as specify which files and graphics to use. Generated documents can range from "pure text, all the way up to color PostScript documents with graphics, table of contents, the whole thing."

SDD*Gen* is priced at \$1,195 for a single-node, multi-user license (one executable, multiple displays). The software requires HP-UX Version 9.04 or later, 32 MB of RAM, and 10 MB of disk space.

Contact Trident Systems, Inc., phone: (703) 691-7768, e-mail: sddgen@tridsys.com, WWW: <http://tridsys.com>.

RoboMon Unix

HEROIX Corporation has announced RoboMon Unix, a client-server tool designed to administer UNIX networks in "lights-out" fashion by automating problem detection.

RoboMon achieves automation through a rules-based engine, which, according to Howard Reisman, President of HEROIX, "follows the chain of reasoning of the systems administrator." It also employs more than 80 built-in sensors to detect and solve problems proactively, collecting more than 1,000 UNIX statistics and analyzing the system in real time. If problems are discovered, RoboMon can take actions to correct the problem and/or notify appropriate system personnel through a real-time event display, e-mail, a pager, and other notification mechanisms. In addition, the

product's built-in escalation capability continuously evaluates results and "tries" new actions until the problem is solved.

RoboMon's native collector is supplemented by the RoboMon Omni Collector, which can gather data from virtually any data file or real-time source. It can analyze structured numerical data, unstructured ASCII text, and other types of data.

Users can program the rules engine to detect and test various conditions. The language used "is very English-like," noted Reisman, and enables users to specify the rules, schedule, conditions, file systems, and other elements. In addition, "We provide a set of rules out of the box," Reisman said. Through a Motif GUI, the user can tailor these rules to a specific environment.

RoboMon detects system, network, application, and database problems, monitoring configuration information, files, file systems, users, groups, processes, system performance, disk performance, network performance, network interfaces, and other system elements.

The tool can also automatically update its knowledge of the system. Reisman explained that it employs detection logic and is "constantly taking a look at what's out there." When a new peripheral is mounted, for example, it is "discovered" and knowledge is collected. As a consequence, "hardware configuration is extremely fluid," he added.

Reisman attributes RoboMon's advanced automation capabilities to its use of the "local intelligence" model. In traditional centralized management methods, he explained, many remote machines have a simple process through which they collect data and send it over the network to the central machine. With the "local intelligence" model, all



RoboMon's Event Monitor

By April 20th, the answers to your technical HP-UX questions will be in San Diego.

collection, decision-making, and corrective actions are performed on, or very close to, each machine being monitored. Because each machine is self-sufficient, problems can be detected or corrected even in the event of network failure.

This model also eliminates what is, Reisman said, a common problem with system administration tools: the tendency "to put a tremendous amount of data over the wire." He added, "By keeping the model local, you can reduce the traffic to (reporting on) problems. You can take action on a local machine and test that action right there."

Although RoboMon eliminates the need for OpenView or other network managers, it can operate with them to complement them as event managers. Because OpenView and similar system management tools are essentially "sophisticated display units," they need other products "to detect problems and take actions," Reisman explained. "RoboMon can do that." The tool generates SNMP traps in response to problems it detects. These traps are then received and interpreted by network managers and will appear in the network manager display, if desired.

RoboMon operates on HP 9000 Series 700s and 800s running HP-UX 9.0 and above. It requires 10 MB of disk and 1 to 5 MB of RAM. It also runs on IBM AIX, Digital Unix, Solaris, and SunOS. Pricing ranges from \$500 to \$5,000 per node. Consulting is available.

Contact HEROIX Corporation, phone: (800) 229-6500 or (617) 527-1550, fax: (617) 527-6132, e-mail: info@heroix.com. ■

Michelle Pollace, the New Products editor for hp-ux/usr, writes Product Focus.

Virtually all of your technical HP-UX-related questions will be answered at the InterWorks '96 Conference & Exhibition between April 20th and 25th. Whether you're new to technical HP-UX issues or a highly experienced user, InterWorks '96 is the place to find answers to distributed workstation issues.

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New Products

File System Organization

EAGLE Software, Inc. has announced Version 3.00 of DISK_PAK for UNIX. DISK_PAK can safely eliminate file system fragmentation as well as cluster frequently accessed files for peak file system responsiveness. Version 3.00 has a new user interface that has the look and feel of OSF/Motif.

Multiple scanning and organizing operations can be done simultaneously. DISK_PAK for UNIX Version 3.00 now reads system configuration files to identify existing file systems that may be organized, reducing the amount of configuration required before running DISK_PAK. The product organizes different file system types, excluding raw partitions. It also organizes various file system sizes, up to the 4-GB size on HP-UX.

DISK_PAK for UNIX now supports HP-UX Version 9.x. It also supports HP disk peripherals and third-party peripherals supported by HP-UX.

Contact EAGLE Software, Inc., phone: (913) 823-7257, fax: (913) 823-6185.

Network Management

Bridgeway Corporation has announced MapSync Version 2.0, which synchronizes object database and network topology mapping functions across dissimilar platforms under the SNMP management protocol.

Now with MapSync 2.0, SunNet Manager users can have SunNet Manager systems interact and share map and event information with HP OpenView and IBM NetView for AIX systems. Manual changes from one map are incorporated together with filtering criteria so that transmitted maps can be customized and tailored to each operation's environment. Changes in object status or to topology

maps can be automatically and simultaneously sent to any of these managers. MapSync can also generate an audit trail on all operations performed.

MapSync allows enterprise users to maintain multiple SNMP-compliant network managers. MapSync can then periodically update object database and topology maps of each of the selected managers.

Contact Bridgeway Corporation, phone: (508) 683-3626, fax: (508) 685-1048.

SICL Support

SBE, Inc. has announced a four-port asynchronous serial hardware/software package in support of HP's Standard Instrument Control Library (SICL). SBE's SEUS4470 EISA provides serial I/O for up to four instruments or peripherals on HP 9000 Series 700 workstations.

A goal of SICL (available from HP) is to make instrument programming more viable than it is today. The library is specifically geared towards communicating with instruments and includes routines to make communications easy. Test equipment, meters, and monitors may be interfaced with the SICL package. Tasks such as status reporting, monitoring, and alarm response can be automated with a SICL application on an HP workstation. The software uses a standard tty interface.

The SEUS4470 4-port EISA controller card with SBE's TULIP driver lists for \$1,090.

Contact SBE, Inc., phone: (510) 355-7635 or (800) 925-2666, fax: (510) 355-2020.

Memory Upgrade

PNY Electronics, Inc. has announced memory expansion kits for HP 9000 workstations. PNY's memory upgrade

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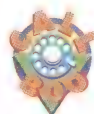
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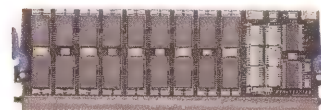
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Multimedia X Terminal

Phase X Systems has announced the S+ Series of X terminals, which provides multimedia capabilities that include telephony across the network with integrated audio and video. A high-speed S-bus expansion allows for expandability, including connection to ISDN for multimedia applications.

The terminals range in benchmark performance from 125K Xstones/1.9 Xmarks to 180K Xstones/3.2 Xmarks. The standard 4 MB of RAM can be increased to 64 MB, and a 4-MB flash memory option is also available. Ethernet interfaces using twisted pair, thin or thick, are available, as well as two serial ports and one parallel port. Energy Star compliant color monitor choices range from 14 inches to 21 inches, with resolution from 1,024 x 7,687 to 1,280 x 1,024. A 19-inch gray-scale monitor is also an option. Pricing for a 17-inch, 1,280 x 1,024 S+ color X terminal with the Intel 960 RISC processor at 33 MHz, 4-MB RAM, mouse, and keyboard lists at \$2,695.

Contact Phase X Systems, phone: (503) 531-2400, fax: (503) 531-2401, e-mail: info@phasex.com.



Contact Walnut Creek CDROM, phone: (510) 674-0783, fax: (510) 674-0821, e-mail: carsie@cdrom.com.

kits are compatible with all hardware and software for Series 700 models 720, 730, 735, 750, and 755. Upgrades for the 705, 710, 712, 715, and 725 models will be released in early April.

The HP 9000 memory upgrade kits are available in increments of 16, 32, 64, and 128 MB.

Contact PNYElectronics, Inc., phone: (201) 438-6300, fax: (201) 438-9097.

File System Optimization

Computer Solutions, Inc. has announced packHFS, a complete set of tools for reducing data access times on HP's UNIX High-Performance File System (HFS). packHFS enables users to defragment file systems and to see the exact allocations of data blocks in a file system. Users can see how data blocks are distributed on a file system, as well as the structure of the file system. packHFS also works in place to optimize file systems.

packHFS can generate summary reports of file accesses. The display provides information on fragmentation levels within the file system, data block allocations of the file system (or a particular

file), sequential ordering of a file's allocated blocks, and division of block allocations between multidisk logical volumes.

Contact Computer Solutions, Inc., phone: (407) 649-0123 or (512) 343-6634, fax: (407) 649-1407.

Perl on CD-ROM

Walnut Creek CDROM has introduced its Perl CDROM. It contains over 7,000 up-to-date, uncompressed, and conveniently organized files of Perl source and utilities. The Perl CDROM contains sources to the latest versions of both Perl4 (4.036) and Perl5 (5.000). Also contained on the disk are mirrors of over a dozen Perl archives, including those at the University of Florida and Texas Metronet.

Perl is an interpreted language optimized for scanning text files, extracting information, and printing reports. The Perl CDROM makes hundreds of Perl programs relating to system administration utilities, mail handling, Usenet news, Internet browsing, file handling, text processing, and more, easily and affordably accessible on a single disk.

The disk retails at \$39.95.

CDE Security Feature

TriTeal Corporation announced TEDsecure, a desktop security module developed with the National Security Agency (NSA) for TriTeal's Enterprise Desktop (TED) implementation of the Common Desktop Environment (CDE).

The NSA's Fortezza approach implements cryptographic algorithms in a trusted hardware and software solution that seamlessly integrates new and existing applications. End users are shielded from the cryptographic details.

Users can secure e-mail communications and protect and authenticate archived messages using data encryption and digital signatures. They can encrypt and sign files for secure data storage in the UNIX file system.

TED and TEDsecure are available on all versions of UNIX for a list price of \$425.

Contact TriTeal, phone: (619) 930-2077, fax: (619) 930-2081, e-mail: info@triteal.com.

Client-Server Manufacturing

System Software Associates, Inc. has announced its BPCS Unix Client/Server software. BPCS operates on HP 9000

servers under HP-UX Version 9.0.4, Informix database Version 7.1, and Windows 3.1 clients.

BPCS Unix Client/Server is an enterprise-wide suite of interoperable applications targeted to the industrial sector. It includes multimode manufacturing applications, supply chain management applications, global financial applications, and information retrieval capabilities.

The end-user functionality of BPCS Client/Server is identical, regardless of the server platforms used. Because the software is generated, not ported, it takes advantage of the unique capabilities of HP 9000 servers and the Informix database. Users of BPCS Unix Client/Server can use an *n-tier* scalable application architecture for their mission-critical, enterprise-wide applications.

Contact SSA, phone: (312) 641-2900, fax: (312) 641-3737, WWW: <http://www.ssax.com>.

Book on OpenView

CBM Books has published *Focus on OpenView: A Guide to Hewlett-Packard's Network and Systems Management Platform*, by Nathan J. Muller. It discusses OpenView and the many applications that plug into it. The book provides information on the many practical issues that are commonly addressed within the framework of network and systems management. The book addresses the OpenView framework, OperationsCenter, managing the physical network, systems management, managing the multivendor enterprise network, and more.

Nathan J. Muller has over 23 years experience in the computer industry. He has written on such topics as frame relay, the synchronous optical network, LAN interconnection, and intelligent hubs.

Focus on OpenView (ISBN 1-878956-

Volt Services Group is a recognized leader in the Computer and Information Technologies Industries. Volt, a full-service company, specializing in long-term employment opportunities, has been awarded a national contract with **HEWLETT-PACKARD** establishing us as a preferred supplier of Computer and Technical Professionals. Our corporate philosophy is well defined with consistent policies & procedures. Through teamwork, we will consistently provide services and business practices that meet and exceed both internal and external customer and employee expectations.

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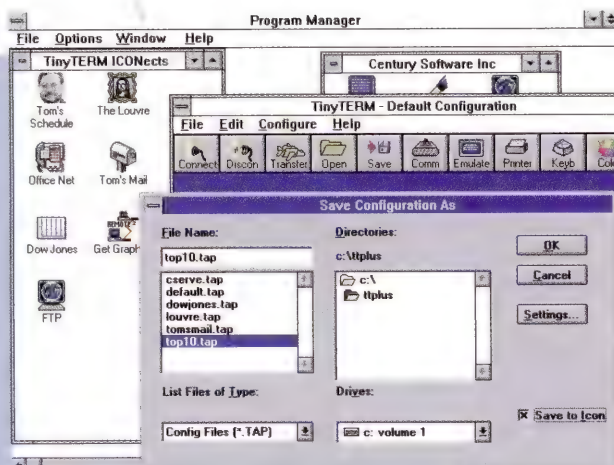
Desktop Connectivity

Century Software, Inc. has announced its TinyTERM Series. The various products will be offered in single- and five-user license packages, with minimum list prices ranging from \$79 to \$299 per user.

The TinyTERM Series includes network file sharing (NFS), complete terminal emulations, high-speed file transfer protocols, FTP file transfer, network printer and file sharing, and a full TCP/IP implementation. It also includes single-step access to UNIX systems, applications, and information services; remote office connectivity; support for seven international languages; a script language that allows for customization and automation; and installation for Microsoft Windows 95 and Windows 3.1.

The product line includes TinyTERM, TinyTERM Plus Version 3.0, TinyTERM+NFS Version 3.0, and TinyTERM Pro. The products are designed to provide connectivity on different levels, from basic to comprehensive, respectively.

Contact Century Software, Inc., phone: (801) 268-3088.



Enterprise Client-Server

Open Horizon, Inc. has announced Connection, designed to transparently link any application with heterogeneous databases and enterprise services.

Connection's modular structure enables organizations to add services such as data access, transaction processing, user authentication, data encryption, central administration, and directory services. Enterprise services are transparently accessible through ODBC and leading database and gateway vendor APIs.

Based on remote procedure calls and POSIX threads to provide both synchronous and asynchronous support, the product supports DCE and will incorporate CORBA and Microsoft's Network OLE and COM.

The software resides on client and server platforms.

Connection is priced at \$295 per user.

Contact Open Horizon, phone: (415) 598-1200, fax: (415) 593-1669, e-mail: info@openhorizon.com.

Archival Software

EMASS has announced a new AMASS software enhancement that allows direct access and archiving to the EMASS AML/E automated media library.

The AMASS 4.2.4 software is a virtual file system. It allows the AML/E to appear and act as online, direct-access storage. Users can access the automated library as a single device with the standard UNIX file system consisting of directories and files. AMASS transparently manages all media using a high-performance disk cache and an online index, so users simply write files to or read files from the library the same way

48-5) is a 320-page, softcover book. It is priced at \$40.

Contact CBM Books, phone: (215) 643-8000, fax: (215) 643-8099.

Collaboration Package

Maximum Computer Technologies, Inc. (MaxTech) has announced DOUBLEVISION for X Window Systems, which enables users to share X Windows applications across any TCP/IP network—including those that offer dialup protocols like PPP and SLIP. When a window is shared using DOUBLEVISION, all users see exactly the same window and share mouse and keyboard control. The product is hardware- and software-independent and works with any X software or hardware to provide automatic color, resolution, and font translation.

DOUBLEVISION must reside on each computer that will share a window. It uses 50 KB of RAM and 3 MB of hard disk space on each computer.

The X Windows version of DOUBLEVISION is available for HP 9000 Series

700 workstations and other workstations. Pricing starts at \$495 per 2-user license.

Contact MaxTech, phone: (404) 428-5000 or (800) 582-9337, fax: (404) 428-5009.

Open COBOL

Accelr8 Technology Corporation has announced Open COBOL to aid conversions from proprietary to open systems. In its first release, Open COBOL will target MicroFocus COBOL, Acucobol, and DEC COBOL running on systems from Sun, IBM, DEC, and HP.

Open COBOL automates moving VAX/VMS COBOL applications to open systems. It processes VAX COBOL source code and creates a new COBOL source that has been automatically adjusted to be compiled using several UNIX COBOL compilers. It makes the changes needed to link the application with Accelr8's porting libraries, Open LIBR8, Open SMG, and FMS/UNIX.

Contact Accelr8, phone: (800) 582-8898 or (303) 863-8088, fax: (303) 863-1218.

they would a magnetic disk.

AMASS 4.2.4 supports the EMASS AML/E configured with VHS helical scan tape drives, providing automated access to more than 100 terabytes of data. It also supports many third-party drives and libraries.

The software is priced starting at \$4,000.

Contact EMASS, phone: (303) 792-9700.

Object-Relational DBMS

Illustra Information Technologies, Inc. has announced the HP-UX version of the Illustra object-relational DBMS. The database enables users to store, manage, and analyze advanced information types such as audio, video, and images in a single database with text and numbers, using industry-standard structured query language (SQL). DataBlade software modules are designed to easily extend the database's ability to handle an infinite number of advanced information types.

Illustra Server and Illustra Developer's Kit for HP-UX Version 9.x are priced for a five-user server license at \$6,250, with volume licensing less than \$900 per user. Illustra Developer's Kit is priced at \$495 each.

Contact Illustra Information Technologies, Inc., phone: (510) 652-8000, fax: (510) 869-6388.

Implementation of CDE

Kovisoft, Inc. has announced Universal Desktop Version 1.0, a standard implementation of the Common Desktop Environment (CDE) on HP-UX Version 9.0.5 and other operating systems. CDE is a joint effort of HP, IBM, Novell, Inc., and Sunsoft, Inc. and is composed of the best desktop technologies contributed by each company. Universal Desktop is a standard



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Chase Research IOLANPlus**Communications Server**

Chase Research has announced the IOLANPlus TCP/IP communications server for connecting modems and serial peripherals to LANs. IOLANPlus is an 8- or 16-port asynchronous communications server used to connect serial devices such as modems, PCs, data access equipment, and terminals/printers to LANs. This new release provides dial-in/dial-out service for remote IP access on networks using SLIP, CSLIP, PPP, and telnet protocols. It also includes "lpd" protocol support to simplify remote printing.

IOLANPlus supports authentication and logging security enhancements. A new system logging feature provides audit trails and time stamping for Internet providers.

IOLANPlus carries a list price of \$1,595 for 8 ports and \$2,145 for 16 ports. Pricing includes a lifetime warranty and surge suppression on all ports.

Contact Chase Research, phone: (615) 872-0770, fax: (615) 872-0771, e-mail: info@chase.com.

**-48VDC Workstation**

Artecon has announced a -48 volt DC version of its Sphinx rackmount enclosure for HP's 9000 Model 712 workstation.

Artecon's Sphinx enclosure facilitates the use of a standard, off-the-shelf, HP desktop workstation in 19-inch racks. It occupies 5.25 inches of vertical rack space while enclosing an HP 9000 Model 712 and any two additional 3.5-inch or half-height 5.25-inch devices.

A front panel switch activates all devices within the chassis, including the workstation. At the rear of each unit, unobstructed access to the HP workstation backplane provides connection to every available port.

The Sphinx48 enclosure is designed to BELLCORE NEBS specifications. It features dual -48VDC inlet leads for inlet power source redundancy and battery-backed alarm system.

Prices start at \$5,995.

Contact Artecon, phone: (619) 931-5500.

25-Tape Datwheel

IEM, Inc. has announced a new 4-mm, dual-drive, 25-tape datawheel that provides up to 200 GB of data storage in a small, compact size. These units are available with or without a barcode reader. Two of these units will fit into a standard 19-inch rack, providing 4 drives and 50 cartridges in one rack. The units are lightweight and compact.

IEM's datawheel products are available with one or two HP DDS-2 DAT drives in each unit. The DDS-2 DAT drives offer from 4 GB (uncompressed) up to 8 GB of storage (assuming a 2:1 compression ratio) and an MTBF of 200,000 POH.

implementation of CDE originally licensed from Novell, Inc. that includes many software corrections.

Features for software developers include electronic mail API, drag and drop, application builder, icon editor, CDE Motif libraries, CDE Motif window manager, and CDE widget libraries. Tools for users include Electronic Mail, Text Editor, Session Manager, Workspace Manager, Program Manager, Calendar Manager, Print Manager, File Manager, and Style Manager.

The Universal Desktop Personal Edition is priced at \$345 for a single workstation, \$695 for three licenses, and \$1,995 10 licenses.

Contact KoviSoft, phone: (408) 985-7100, fax: (408) 246-3127, e-mail: info@kovi.com, WWW: <http://www.kovi.com/>.

Client-Server Database

Computer Associates has announced Version 1.1 of CA-OpenIngres on nearly

all major UNIX platforms.

The new version provides major advances in performance, reliability, and scalability while preserving client investments in data, applications, and skills.

Major enhancements include performance and very large database (VLDB) improvements, improved client-server data access, the ability to make better use of SMP platforms, a spatial objects library, SQL92 support, and XA compliance.

Existing CA-OpenIngres clients under active maintenance can upgrade to Version 1.1 at no charge. Pricing for new licenses varies by platform, starting at \$1,000. Success Packs—including the CA-OpenIngres database, connectivity, and application development software—also are available.

Contact Computer Associates, phone: (800) 225-5224 or (516) 342-5224, WWW: <http://www.cai.com>.

IEM's datawheel products weigh only 27.2 pounds and are UPS-shippable.

IEM's datawheel products are supported with Network Archivist, Networker, ARCserve, BudTool, Quick Restore, SM-arch, Open V-Backup, and Omniback II software packages.

Contact IEM, phone: (970) 221-3005, fax: (970) 221-1909, e-mail: info@iem.com.

Product Ordering Online

ANDATACO has announced On-The-Net Version 2. On-The-Net, an electronic Internet forum for UNIX workstation hardware, software, and service information, now makes product pricing and ordering available interactively through Mosaic or any World Wide Web viewer. An FTP site is also maintained, where customers can view or download ANDATACO evaluation software and technical information 24 hours a day at no charge. The Universal Resource Locator for ANDATACO's On-The-Net is: <http://www.andataco.com>. ANDATACO's FTP site is <ftp.andataco.com>.

In addition to customer service information such as system fixes, patches, work arounds, and product information, end users can now see product photos, receive pricing, and place orders. Customers can build their own purchase orders and submit them 24 hours a day. This forum allows for secure payment by credit card, PO#, or COD.

Contact ANDATACO, phone: (619) 453-9191 or (800) 334-9191, fax: (619) 453-9294, e-mail: inquire@andataco.com.

System/36 Migration

Emphasys, Inc. has announced EmphaSys/36, which uses UNIX to provide an alternative System/36 migration to TRM's Advanced 36.

EmphaSys/36 can support System/

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Winchester Systems FlashDisk H/Z**RAID Disk Array**

Winchester Systems Inc. has announced a new "High Availability" model of its ultra-high performance RAID disk arrays for open systems called FlashDisk SCSI "H/A." FlashDisk H/A stores up to 20 drives of 1, 2, or 4 GB each for a total capacity of up to 80 GB in single pedestal enclosure. Drives are easily served by removing the side dress panel and "hot swapping" a failed drive. Fans and power supplies are easily "hot-swapped" from the rear panel.

FlashDisk H/A provides RAID 0, 1, 3, 5 data redundancy including "hot-spare" automatic data rebuild plus "hot-swap" online drive replacement. The array delivers up to 5,400 disk read/write operations per second using its two disk controllers.

Prices start at \$9,120 for a 4-GB unit with a single controller and 8-MB cache delivering up to 2,700 disk reads/writes per second. An 80-GB unit, with two controllers each, delivers up to 5,400 reads/writes per second and is \$58,546.

Contact Winchester Systems Inc., phone: (800) 325-3700 or (617) 933-8500, fax: (617) 933-6174, e-mail: info@winsys.com.



36 applications in UNIX environments, so companies are not required to abandon their existing software applications. Current cabling can also be used, and EmphaSys/36 provides a complete System/36 environment on the new host platform.

With this host, migrated applications run 10 to 30 times faster than on the IBM System/36, as opposed to only 4 to 8 times faster on IBM's Advanced 36. Improvements in processing speed, along with advancements in versatility, are made accessible without sacrificing affordability, disk space, or number of users.

EmphaSys/36 is available in three different versions. Small- and medium-size versions use the SCO UNIX operating environment on an Intel-based PC, while the large-size version supports

migrated System/36 applications on a Digital AlphaServer 400.

Contact Emphasys, Inc., phone: (800) 800-3399 or (612) 941-9337.

Automatic Startup/Shutdown Unit

Texas ISA has announced an addition to its UNIX Power Solutions, the new Model 7030 Intelligent Automatic Startup/Shut-Down Control Device for UNIX Systems.

With a built-in Ethernet interface, the Model 7030 makes it possible to ease the operation and control of networked UNIX systems, with just a flick of a switch. The system power ON/OFF (startup/shutdown) process can also be automated by either the programmable timer, a UPS Power Fail Signal, a shutdown request from the RS-232 or

modem ports, or even by environmental triggers such as temperature, humidity, vibration, and smoke. Additionally, emergency alarms or preset messages can be sent to a pager.

A Model 7020 without the Ethernet interface is also available for stand-alone workstations or small workgroups. Prices range from under \$1,000 to \$2,500.

Contact Texas ISA, Inc., phone: (800) 361-2258 or (713) 493-5746.

Peripherals

LEGASYS INTERNATIONAL, INC. has announced its entry into the HP market. The company offers products and services to complement HP workstations.

LEGASYS provides a full range of peripheral products to value-added resellers and large corporate end users in 24 countries. It focuses on service, competitive

prices, and rapid delivery, filling orders from its extensive inventory within 48 hours or less.

The LEGASYS products include disk, tape, and optical drives, memory upgrades, RAID arrays, CD-ROMs, disk and tape enclosures, SCSI cables, and terminators.

Contact LEGASYS, phone: (800) 955-4229 or (303) 469-6114, fax: (303) 469-4699, e-mail: inquire@legasys.com.

Failover Management

Qualix Group, Inc. has announced FirstWatch 2.2, its high-availability failover management software for mission-critical applications in the client-server environment. Version 2.2 includes an alternative heartbeat channel, GUI script builder, and enhanced security

UniPress Software PC2X

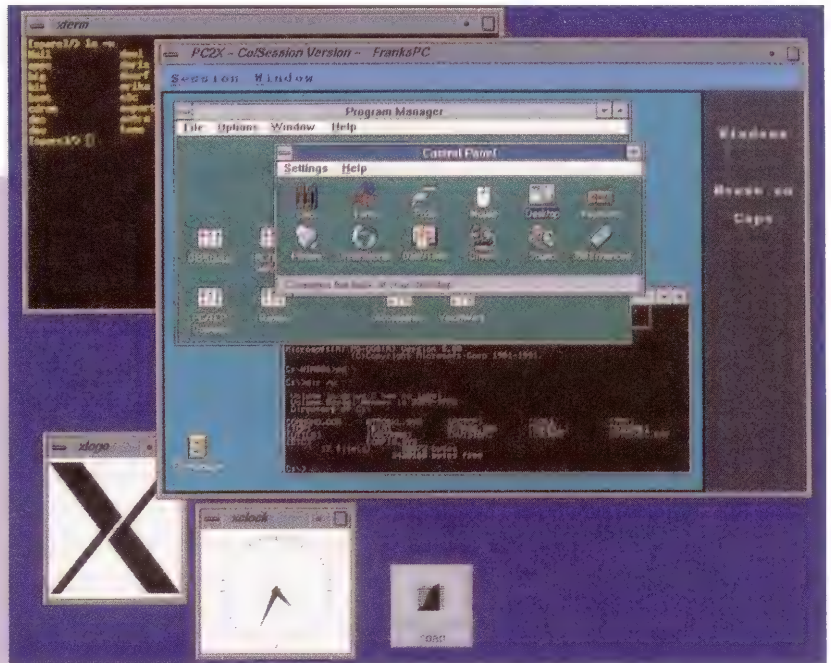
Remote PC Control

UniPress Software, Inc. and Triton Technologies, Inc. have announced Winsock support in CoSession PC2X. With CoSession PC2X, the PC, running DOS or MS Windows, displays in an X Window from which users can run any PC application. Performance is not affected, because the programs run natively on the PC. Users can control multiple PCs simultaneously by running several CoSession PC2X windows. CoSession PC2X can now work with any Winsock-compatible TCP/IP stack.

PC2X is a client-server application. The server side resides on one or more PCs. It provides the full PC session to the CoSession PC2X client, which runs on a UNIX workstation.

A single-user starter pack, which consists of one PC Host and one UNIX client, costs \$595. Additional UNIX client sides cost \$495, and additional PC Host sides cost \$125. Volume discounts are available.

Contact UniPress, phone: (908) 287-2100 or (800) 222-0550, e-mail: info@unipress.com.



to \$3,500 per floating seat for volume purchases. Training, telephone support, and consulting services are available.

Contact ASTI, phone: (303) 730-7981, fax: (303) 730-7983, e-mail: info@advancedsw.com.

Configuration Management

The Database Solutions Company has announced the Configuration Manager module to Control Center Plus. Configuration Manager automatically optimizes database and hardware configurations considering the trade-offs between memory, CPU, and disk I/O.

Configuration Manager configures resources for desired performance levels; automatically performs cost-benefit analysis of different configurations; allows configuration for multiple databases, machines, etc; and is fully integrated with monitoring and tuning tools.

Configuration Manager and all of the Control Center modules are fully integrated via drag-and-drop in the PC Windows environment. The release of Configuration Manager is the latest in a series of modules for Control Center, which simultaneously monitors the database, network, and system.

Contact The Database Solutions

and memory management features. In addition, Qualix is announcing FirstWatch support for FEED and Token Ring networks.

FirstWatch provides failover management for systems, applications, and services. The software provides automated failure detection, recovery, restart, and failover services for any type and size network.

FirstWatch is compatible with Sun's SPARC Storage Array and other RAID disks. The software will operate with any Sun SPARC platform of HP 9000 Series 800 machines.

FirstWatch pricing ranges from \$14,995 to \$34,395. Support on a 24-hour, 7-day basis is available.

Contact Qualix Group, Inc., phone: (415) 572-0200, fax: (415) 572-1300, e-mail: info@qualix.com, WWW: <http://www.qualix.com>.

Design and Reuse Tool

Advanced Software Technologies, Inc. has announced Version 1.2 of Graphical Designer, an object-oriented design and reengineering tool. Software developers can now generate C++ and C code directly from software designs and reverse-engineer existing C++ and C software with automatic generation of designs of this preexisting software. This feature enables the migration of existing software.

Various software components can be defined with designs that use existing methodologies such as Rumbaugh, Booch, Shlaer-Mellor, and Jacobson/Use Case or by creating custom methodologies. Software designs can then be used for developing different applications.

Graphical Designer prices start at \$4,999 for the first floating seat and drop

Company, phone: (800) 933-7668 or (804) 794-0354, fax: (804) 794-0813, e-mail: 73244.3365@compuserve.com.

Project Management

Digital Tools supports Oracle through the new AutoPLAN Exchange. AutoPLAN Exchange for Oracle provides two-way exchange of project data between the AutoPLAN II project management system and Oracle databases. AutoPLAN Exchange works with Oracle7 to help automate projects.

AutoPLAN II and AutoPLAN Exchange are part of AutoPLAN Enterprise client-server project management software. AutoPLAN II also offers information-sharing with Microsoft Project.

Other features of AutoPLAN Enterprise include time-tracking of team members, presentation-quality graphics, and an open API for further integration with enterprise data and applications. AutoPLAN Enterprise modules are priced from \$495 to \$10,000 and are available on major UNIX platforms and Microsoft Windows.

Contact Digital Tools, phone: (408) 366-6920, fax: (408) 446-2140, e-mail: info@digit.com.

Object Discovery Tool

ParcPlace Systems, Inc. has announced MethodWorks on HP-UX and other systems. MethodWorks is designed to help corporate developers discover the correct business objects to produce quality applications. Corporate application developers can now describe business functionality in end users' terms, discover the correct objects required to support that functionality, and optimize those objects for reuse and consistency.

Enterprise Traffic Reporting

Armon Networking, Inc. has announced NetReporter, an enterprise traffic reporting tool that tracks network traffic over time and provides clear, accurate reports. NetReporter is a fully integrated add-on to the OnSite Manager suite of RMON-based applications.

NetReporter is an open reporting system that offers flexible data collection with RMON data stored in an SQL database. It also generates preformatted and customized reports in either graphical or textual format. Aggregated information provides an enterprise-wide view of traffic on the network. This information can be used for planning and configuration of the network.

OnSite NetReporter includes bundled SQL database support for report generation. The product also allows export of data for use with popular spreadsheet products and as an input to network planning and configuration packages. It is priced at \$4,000.

Contact Armon Networking, Inc., phone: (805) 965-0859, fax: (805) 965-5689.

MethodWorks can be used alone or in combination with VisualWorks, ParcPlace's tool for developing portable applications with object-oriented technology. MethodWorks helps developers perform a more accurate analysis of user requirements before going to code, while VisualWorks helps reduce coding effort during application development.

MethodWorks is priced at \$995 for Windows, Windows NT, Macintosh, and Power Macintosh, and \$1,395 for UNIX-based systems.

Contact ParcPlace Systems, Inc., phone: (408) 481-9090, fax: (408) 481-9095.

AppleShare File Server

AGE Logic Inc. has announced that its PacerShare 3.0 UNIX AppleShare file server fully supports the performance enhancements available in Apple Computer Inc.'s AppleShare Workstation 3.6 (ASW) client. PacerShare 3.0 dramatically increases file serving speed.

PacerShare is a high-performance AppleShare file server hosted on UNIX platforms, including HP-UX. As an AFP 2.1-compliant implementation of the AppleTalk Filing Protocol, PacerShare lets Macintosh users mount directories as if they were Macintosh Volumes.

PacerShare provides complete interoperability with PC-NFS, Portable Netware, PathWorks for UNIX, and LAN Manager for UNIX.

PacerShare pricing starts at \$3,000 for a 20-user license. Volume discounts are available.

Contact AGE Logic Inc., phone: (619) 755-1000, fax: (619) 755-3998, e-mail: info@age.com.

Three-Tier Testing Tool

PLATINUM technology, inc. has announced PLATINUM Final Exam, a tool suite that automates software testing cycles in three-tier client-server applications and increases software quality throughout application development.

Built-in distributed networking support enables thorough testing for client-server applications. Tests execute remotely on multiple client workstations simultaneously and communicate with each other using synchronous and asynchronous messaging. Users can run, monitor, and control an unlimited number of tests, executing over a network, from a central workstation. The object-oriented testing environment is designed to save time, eliminate repetitive tasks, and provide accurate and detailed records of problems during software tests.

PLATINUM Final Exam is based on technology developed by RadView Software, Ltd., of Tel-Aviv, Israel.

Contact PLATINUM technology, inc., phone: (708) 620-5000, fax: (708) 691-0710.

Component Reuse

ObjectSpace, Inc. has announced ObjectCatalog, a complete, distributed, cross-platform component reuse facility for locating reusable components. ObjectCatalog enables different development teams to share information about software, design patterns, frameworks, documents, and other corporate assets.

ObjectCatalog allows development teams in different locations to search the corporate catalogs and check for reusable components that already exist or that are currently being developed. Developers can also share information on components that are slated for future development.

ObjectCatalog is priced at \$8,500 for the server and between \$495 and \$795 for each client, depending on the volume of clients. ObjectCatalog runs on Windows, HP-UX, and other platforms.

Contact ObjectSpace, Inc., phone: (214) 934-2496, fax: (214) 663-9099, e-mail: info@objectspace.com.

New from HP

OperationsCenter

HP has announced a new version of HP OpenView OperationsCenter for managing multiple distributed domains throughout an enterprise. Operations Center is a key component of the HP OpenView Solution Framework.

Enhancements to Version 2.0 include support of enterprise-wide management hierarchies through manager-to-manager communication, orchestrated cooperation among distributed management centers of expertise, support of improved workflow coordination among operators, new mainframe-management functionality, additional agent platform support, and support of Oracle as a data repository. In addition, building on the earlier HP OpenView Solution Framework announcement, a new set of open APIs strengthens HP OpenView as an application integration point for operations and problem management.

Network Node Manager

HP has announced a new version of HP OpenView Network Node Manager, for managing customers' larger and more complex enterprise-wide domains. Enhancements include a new client-server-based architecture to maximize server CPU use, support of a greater number of operation consoles, a unique map zoom-in capability, added database support, and many user-interface enhancements. HP also will offer an additional lower-priced product to provide customers with a flexible range of price/performance options for large and small management domains. In addition, new support pricing will enable customers to receive free auto-

matic upgrades of major releases, including Network Node Manager 4.0.

Storage Management

HP has announced new versions of HP OpenView OmniBack II and HP OpenView OmniStorage applications. Both OmniBack II and OmniStorage have been highly integrated since 1993 with HP OpenView OperationsCenter. Enhancements include additional backup and storage-platform support, the ability to back up data to the mainframe, new online database backup, and support of three-tier hierarchical storage management.

Working in conjunction with Stage3 (developed by Emprise Technologies and marketed by Boole & Babbage Storage Division), customers now can back up data from OmniBack II to the mainframe. HP also announced plans for high-speed, online database backup through integration of OmniBack II with Oracle, SYBASE, and Informix databases. Customers will now be able to back up data without bringing down databases.

HP OpenView OmniBack II Version 1.3 is now available. OmniStorage Version 2.0 is expected to be available in December.

Attention vendors: New product announcements should be sent to New Products Editor, hp-ux/usr Magazine, Interex, P.O. Box 3439, Sunnyvale, California 94088-3439, USA, e-mail: pollace_michelle@interex.org.

Deadline for submission is 2 1/2 months prior to publication.

New Products refers to numerous products by their trade names. In most cases, these designations are claimed as trademarks or registered trademarks by their companies.

Sign up NOW for Spring 1996 Listings

hp-ux/resource directory

The *hp-ux/resource directory* is a complete resource guide for HP-UX users seeking answers. This is one of the industry's most extensive reference guides for HP-UX products, services, and vendors. It will be devoted entirely to HP 9000 users operating in multi-user, workstation, and multi-system UNIX environments. This bi-annual directory, published each year in March and September, is a separate publication mailed out with *hp-ux/usr* magazine, the only HP-specific publication on the market.

Each company is listed by category, with each listing including company name, product, operating environment, and phone number. The cost for a full year listing in the *hp-ux/resource directory* is \$475. Discounts are available for current advertisers in *hp-ux/usr*, *Interact* or the *Vendor Service Source Directory*. Advertisers who run more than one listing per issue also receive a discount. There is a 75-word maximum per listing, with a charge of \$1.00 per word over the maximum.

The Spring 1996 *hp-ux/resource directory* will be published in **March** with **all listings due by December 1, 1995**. For further information contact Nader Saghafe at the Interex Advertising Department 408.747.0227 or 800.468.3739. Fax: 408.747.0947. Written inquiries should be addressed: Nader Saghafe, Interex, 1192 Borregas Avenue, Sunnyvale, California 94088-3439 U.S.A.

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Application Development Tools/4GL	Hardware Subsystems	Project Management
Application Software Design	Help Desk Management	Protocol Converters/ Interfaces-Hardware
Backup Hardware	Human Resources and Personnel Systems	Publications 82Purchase Order Management
Backup Software	Image Processing	Purchasing
Bar Code Data Collection Systems	Image Storage and Retrieval Management	Quality Assurance Tools
Batch Job Management	Industrial Terminals	Records Management
Business Software	Instrument Control	Rentals
CAD Software/Hardware	Integration Tools	Report Viewing, Printing, and Distribution
Case Tools	Inventory Control	Report Writers
Change Management Tools	I/O Boards	Sales and Marketing
Civil Engineering	Job Scheduling and Workload Management	Scheduling
Client-Server	Laser Printers	Scheduling/Task Management
Communications	Laser Printing Software	Security
Communications Servers	Local Area Network (LAN)	Software
Communications Software	Mail Management and Marketing	Software Development Tools
Consulting	Maintenance	Software Distribution Tools
Consulting/Systems Integration	Manufacturing	Software Maintenance and Testing
Customer Support/Help Desk Systems	Manufacturing Software	Spoolers
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Database Management Tools	Memory	Statistics/Data Analysis
Data Center Management	Memory Upgrades	System Integration
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Desktop Publishing	Multimedia	Tape Backup Products
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Distribution Resource Planning	Networking	Tape Storage/Data Interchange
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Document Management	Network Integration	Telephone Management
Electronic Data Interchange (EDI)	Network Management	Terminal Emulation
Electronic Form Printing	Operating System	Text Editors
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E-Mail and Directory Integration	PC Compatibility	Time Reporting Terminals
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Executive Information Systems	Performance	User Groups
Facility Maintenance Software	Performance Software	Warehousing & Distribution
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Forestry		
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Other categories may be created as needed.

hp-ux/resource directory

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<input type="checkbox"/> Listing (includes two issues)	\$475*	\$375**	\$ _____
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<input type="checkbox"/> Cross Reference*****	\$200	\$200**	\$ _____

* For current vendors who advertise at least 6 times a year in hp-ux/usr, Interact, the cost is \$425.

** For current vendors who place more than one listing or who have a listing(s) in the Vendor Service Source directory.

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***** A single listing can be placed in multiple categories for an additional charge of \$200 per category.

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Attention: Nader Saghafi, 800.468.3739, 408.747.0227, **Fax 408.747.0947**

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- Member rates for Interex Conferences
- Membership in your Regional User Group (RUG) at RUG membership rate
- Voting Privileges for Board Elections and Advocacy Surveys
(i.e., system improvement surveys)

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■ **online service package** includes ALL the benefits of Contributing Level plus:

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- **Information Access**—full text search and downloading capabilities for all Interex publications including: *hp-ux/usr*, *Interact*, Vendor Resource Directories, product news and announcements, and Conference Proceedings abstracts.
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